Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves

PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY
MONADNOCK BLOCK, CHICAGO

H. B. McMEAL, President and Editor. H. D. FARGO, Secretary and Treasurer. J. C. KELSEY, Vice-President and Financial Editor.
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Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1897

Volume 68
Number 19

CHICAGO, SATURDAY, MAY 8, 1915

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

FOR SUCCESS IN LIFE.

If you wish success in life, make perseverance your bosom friend, experience your wise counsellor, caution your elder brother, and hope your guardian genius.—Joseph Addison.

A New Independent Securities Company.

When it is considered that the investment in telephone properties in the United States is nearly two billion dollars, some idea may be had of the marvelous commercial development of the industry, especially during the past twenty years. In 1895 there were less than three hundred thousand telephones in service, as against nearly ten million today. The demand for service compelled this growth, and now the telephone ranks as the fourth greatest industry of the country.

To finance so great a growth would not have been possible, were the telephone business not so strong. It is not affected by hard times, political conditions, the condition of foreign affairs, tariff reductions and other situations such as have recently retarded business. In fact, there are few conditions which materially diminish telephone earnings. During the recent business depression telephone earnings were little affected, while railroad, manufacturing and merchandising suffered heavily.

To acquaint investors generally with the inherent value of Independent telephone securities and to interest them in the purchase of telephone stocks and bonds, is the motive behind the formation of a company headed by B. G. Hubbell, of Buffalo. This company is now in the course of formation, and a financial letter by Mr. Hubbell, published in this issue, sets forth the plans and purposes of this new concern. The principal idea, briefly stated, is to have telephone men sell telephone securities. There is a growing demand for such securities, on account of their stability and safety. Telephone men are best equipped to market them. The average telephone manager has a comprehensive idea of the business. Moreover, he is in touch with men in every town who are looking for safe investments.

From letters received by Mr. Hubbell from exchange managers in different sections, all are enthusiastic over the plans outlined, and it is the belief that companies such as this will do much to popularize telephone securities and give them a market in every city, town and village, with advantages resulting to both investors and operating telephone men alike. Independent telephone men should give this new finance company their encouragement and support, as it is formed in the interests of the industry as a whole.

Notifying the Subscriber of Observation Tests.

It is a question if any easier method of gaining the subscriber's good will can be put in practice than by notifying him whenever his line is to be placed under extended observation. Failure to do this opens the door to distrust if the situation is discovered; whereas a frank announcement that "for the good of the service" the company is to scrutinize the operations of a line for a more or less extended period, goes a long way toward establishing the reputation of the local management for fair dealing.

Temporary supervision is one thing, but where real effort is being made to improve the service by hunting down elusive complaints by several days' close checking, it is distinctly worth while to let the subscriber know what is afoot. Just as the simple announcement "Line Busy—No Charge" shows the subscriber that the company is not trying to take advantage of him, so a notification that for a time the normal privacy of his service is to be a little altered in the interest of a still better service in the future, is something well worth giving. But the observation should be maintained properly, for can there be a worse mistake than to advertise improvements in method which are not realized in practice?

If You Can't Construct, Don't Obstruct

By HERBERT KAUFMAN

In the mirror of conceit you behold yourself as a stern, firm, level-headed, conservative force—a man of mature judgment, of deliberation and power. In the eyes of the outsider, you are a narrow-gaged, stubborn, unimaginative ignoramous—a creeper accidentally attached to a growing business, carried upward by the strength of progressive associates.

The world is full of you. Every ship carries its barnacles. Many firms succeed in spite of reactionary members. You have a voice in the management, but it has never lifted to inspire. You mistake the right to pass judgment for the ability to form a competent opinion. When enthusiasm paints the future with rainbows, you behold the prospect with forecasts of failure.

Nothing is certain unless it has been achieved. There is a percentage of risk in all attempted undertakings. The road-breakers of progress are the men who think: "It can be done."

Time and time again, men have accomplished through unflagging confidence, things which precedent and cold reason had declared impossible. Because you are in a position to interfere, discourage and check enterprise, don't delude yourself with the idea that it is efficiency which enables you to prevail over others.

A grain of dust can clog a watch. A stone can derail a train. Shipworms can sink a vessel. Burrowing moles can destroy a dyke. But even you will not therefrom deduce that dust and boulders and vermin are co-equal with the clockmaker and the engineer and the shipwright and the dyke-builders. The idiot can destroy the lifework of a genius. An inventor may hammer away for a year, but the same tools in the hands of a fool can destroy his product in an instant.

Down in your heart you know your limitations. What you do not understand, you undermine. What you cannot see you declare non-existent. You weigh facts on dishonest scales. You look with a near-sighted vision. You consider a situation closed because you are not open to conviction. You have been raised to an important position by forces beyond your own control, but you are not important.

Brain never manifests itself so plainly as when power modestly asks for information and evinces a desire to be taught.

The activities of this earth are so manifold, revolutionary changes are so constant, opportunities for improvement are so numerous, that no one man can rely upon his individual wisdom and observation.

You can't be graduated from experience. The show of life touches new reasons every hour. Go to your studies. Join the class tomorrow morning with open ears and an open mind.

No man requires education so exceedingly, as he who considers himself beyond its need.

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Protection of Aerial Cables from Chafing in Trees

Attachments Fastened to the Messenger Strand and None to the Cable—Good Results Obtained by Utilization of the Pull-off Tree Hook and Wooden Tree Guard Methods—Reproduced Through Courtesy of The Telephone Review

By W. H. Van Deusen

The protection of aerial cables against damage in trees has long presented a difficult problem to the construction and maintenance forces. Either from improper original construction or from changing tree conditions resulting from growth, cables have a well recognized tendency to chafe against the trunks and branches, or to lie in the crotches of trees through which they pass, in time becoming a source of considerable trouble.

A hole may finally be worn or torn through the lead covering; or in time, through constant vibration, the sheath may become brittle and filled with tiny cracks (crystallized) after which moisture easily finds its way to the wires within, Figs. 1 and 2. Round wooden molding and tubes of galvanized sheet iron have been generally used as a covering to prevent contact with trees, but their use has never solved the problem. During the last year a special study of this subject was made in the Long Island division of the New York Telephone Co., with gratifying results.

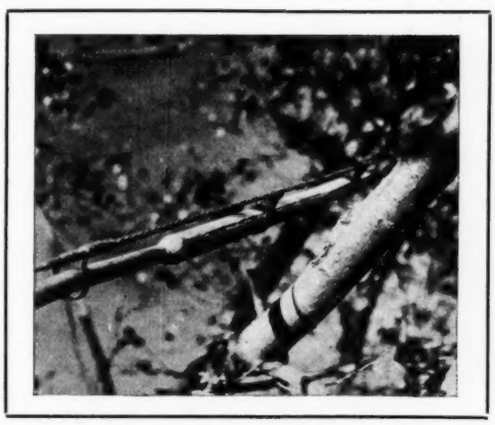


Fig. 1. Split Sleeve Placed on Cable.

Fig. 2. Crystalized Sheath.

Fig. 3. Galvanized Tree Guard Broken Away.

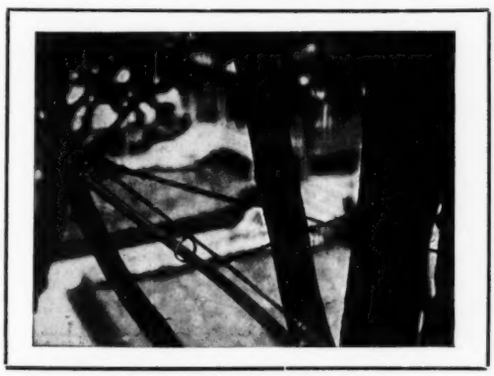


Fig. 4. Example of Pull-off.

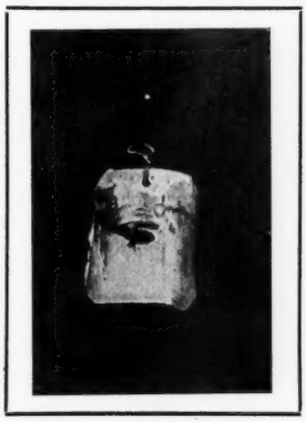


Fig. 5. Damaged Sheathing.

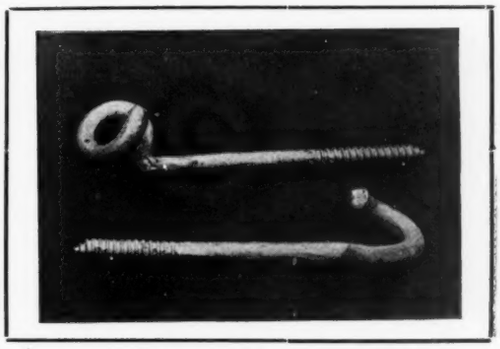


Fig. 6. Galvanized Steel Tree Hooks.

Good first construction is the primary requisite for clear tree conditions; but even with the exercise of greatest care, it is impossible to run strand so as to clear all interference in dense growths. A 24-inch saw, judiciously used, is of inestimable value, but trimming rights are frequently unobtainable.

Many of the worst conditions found in old plants can be remedied by the simple expedient of raising the cable, placing an extension arm, or slightly leaning a pole. By all means these methods should be used where the height of poles and other conditions will permit. It is assumed that only where such treatment was not practicable, have wooden molding and galvanized tree guards been used.

The common fault with both these articles is that they do not keep pressure from the cable, but act simply as a shield between the tree and the cable to take up abrasion. The molding is, for ease of manufacture, usually constructed of some light, comparatively soft wood, such as spruce. It soon wears; it slips on the cable; and in crotches of trees it breaks away, frequently leaving the cable twisted over the strand. Aside from its tough wearing qualities, the galvanized tree guard is no better. In addition, it has the serious defect of being sharp at the ends. Frequently this fault is the cause of more serious cable failures than could result from the trees in which the guards have been placed. There are many cases on record of cable sheaths having been gouged or broken by the end of the galvanized tree guard itself. Fig. 3 shows a galvanized tree guard, liable to damage the sheath, and Fig. 5, a gouged sheath.

The basic fault of these methods is that the "protection" is attached to the *cable*. The new methods developed by the Long Island plant department differ fundamentally in that all attachments are made to the *strand* and *none to the cable*, which is is left freely suspended in the messenger strand rings.

The pull-off shown in Fig. 4 can be used to advantage whenever the cable lies between two limbs and in contact with one of them. It is not essential that the limbs be opposite each other; one may be ten to fifteen feet from the other along the direction of the strand. The pull-off is constructed of eight strands of No. 14 N. B. S. galvanized iron wire, or its equivalent. This may be attached to the tree either with a standard galvanized No. 0 screw-eye, as illustrated, or with a three and one-half inch galvanized lag screw. It is important that the lag or screw-eye should be placed at right angles or perpendicular to the pull-off so that the strain comes across it and does not tend to strip the threads in the wood. One pull-off may serve to clear several branches at once. It is neat, does not damage the tree, and has the advantage of being almost invisible from the ground.

The tree hook shown in Figs. 6 and 7, is made of 5/8-inch galvanized steel with a lag thread cut on one end. The other end is similar in shape to a standard style C ring. This is of general use wherever the stock of wood in a branch or trunk of a tree is heavy enough to take and support it. The tree is first bored with a 7/16-inch to ½-inch hole. The hook is then screwed in to the desired depth—the farther in the more rigid it will be and the less liable to bend. Then with the ring end horizontal, the strand is slipped in place, when a one-quarter turn places the hook upright and locks the strand in place. This hook not only serves to push the strand out from the tree but will raise it up, a fact which renders it particularly valuable for use in the crotches of trees.

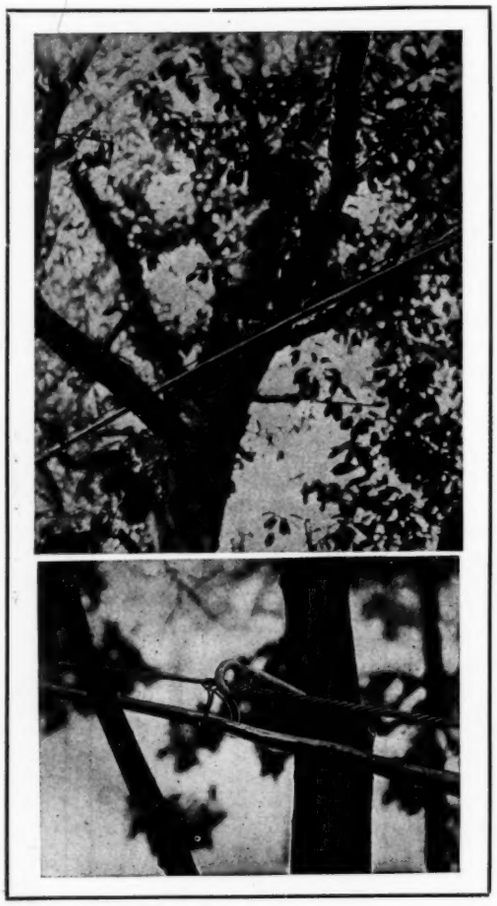


Fig. 7. Tree Hooks in Use.

The wooden tree guard, shown in Figs. 8 and 9, is constructed of two oak blocks, grooved in the middle to take the strand, and provided with an interior clamp for fastening the block rigidly to it. The blocks are beveled at the ends to allow a branch, should it sway off, to move back on the block without tending to displace it. In obstinate cases, such as occur with limbs of willow or poplar trees two or three inches in diameter, it is sometimes necessary to place two blocks on the strand, butted end to end, with the inside beveled ends sawed off.

A combination of the wooden tree guard and a pull-off upward serves nicely to clear old cables from crotches of trees in municipalities where the placing of the tree hook would not be permitted.

These different methods have now been in use and under observation for over eight months, under some of the worst conditions conceivable and are standing up well. While the try-out indicates that better results have been obtained than with any previous methods, certain objections have been suggested. It is possible that the galvanized iron wire may finally rust, particularly where it chafes against the screw-eye and the strand. There may be enough motion of the strand through the tree hook to wear off the galvanizing and rust both the strand and the hook. There is now on record one case of a strand being chafed so badly by a tree that in 12 years it rusted completely through. The hook in the tree tends to ground the cable which is not thought desirable.

The methods here described may prove to be a step toward an entire solution of the problem.

Fig. 8. Wooden Tree Guards.

Fig. 9. Wooden Tree Guards in Use.

Permission to Trim Trees.

A rural subscriber, says the Transmitter, of Baltimore, Md., had persistently refused permission to have his trees trimmed. A telephone man who knows something about human nature took the case in hand. He stopped casually by the subscriber's gate one day, without divulging his connection with the company, and engaged him in conversation about things of interest to ruralities. The talk drifted around to trees.

"Those trees of yours need trimming mighty badly," said the telephone man. "Why don't you make the telephone company do it? I see they've got their wires here. I made 'em trim mine."

The trees were trimmed by the company.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties —Prepared Under the General Supervision of Stanley R. Edwards—This Section on Economics of Telephony written by James H. Shoemaker

Quiz Questions on the Preceding Installment.

45. What reasons are given for the existing confusion relative to government ownership? What other important point is discussed?

46. What comparison of utilities is termed unscientific?

47. Show by means of a diagram, the subdivisions of public and private ownership. Is there any good reason why a privately-owned plant could not be leased to and operated by a municipality or state?

48. Upon what basis do the extremists of public and private ownership proceed?

49. What is a more practical and immediate problem before the telephone men than national ownership?

50. State four proposals relative to ownership and operation of utilities.

51. Why are would-be sellers of privately-owned telephone plants not inclined to encourage buying by municipalities, states, or nation?

52. What mistake did one economist make in investigating a standard for a basis upon which to judge the merits of private and public ownership? In addition to the matter of securing new capital or credit for extensions and improvements, what other things should be considered in deciding the issue of private and public ownership of utilities?

CHAPTER III. Ownership and Operation (Cont'd.)

53. *Relation of Utilities to Spirit and Purpose of the Age.*—It is easy enough to say that in opposing the railroads, or the telephones, the prevailing spirit of the people, as a whole, is unreasonable. But, as suggested by a noted authority of an earlier age, it is not possible for any one man or group of men to effectually indict, convict, or punish the whole human family, a race, a nation, a state, or even a municipality. It can easily be shown that, in destroying the credit of the railroads, telephone companies or other utilities, a great damage will be wrought upon business as a whole. That the utilities are a large and important part of the total activities of our time is a statement, the truth of which no one will question. In making this truthful showing, do we not prove that utilities must bear an equally great and important part of the total responsibility for the spirit and purpose of our age?

If it be true, as it is, that the utilities are a large and important part of the business world, and if, in the attitude of the people as a whole toward utilities, there is a spirit or purpose of opposition, reprisal or revenge—then it is plain that the utility manager must bear a corresponding proportion of the burden of overcoming this evil. Utility managers therefore have opportunity, as well as responsibility, in proportion to their importance in the business world.

It has been suggested that the various regulative commissions will be compelled to provide themselves with publicity bureaus. The idea behind this suggestion is that the work of a commission is not completed when it has merely been just and prompt in all of its investigations and decisions. On the contrary, in addition to being efficient, prompt and just, each commission must "keep on good terms with the people." Utility managers will readily appreciate the importance of this suggestion as applied to public utility commissions. But is it not more important for utilities, themselves, to keep on good terms with the people as a whole? Is it not more essential for utility managers to uphold and encourage common sense and goodwill among the people?

54. *A Proposed Standard for Judging Public Ownership.*—The most important benefit or curse bestowed upon a people by a utility is not always the mere supplying of water, light, power, transportation or communication. It is not always the improvement of the service nor the reduction of the cost, important and valuable as these things may be. Every utility is a sower of the seeds of helpfulness or antagonism and a grower of good-will or ill-will. *Every utility is either increasing the antagonisms or cultivating a kindlier spirit between the servant and the served.*

Telephone men may just as well accept the statement made by Franklin K. Lane in a magazine article which he wrote while chairman of the Interstate Commerce Commission. He said that in our efforts to regulate privately-owned public utilities, we are making an *experiment.* The United States is experimenting with the theory of "compelling private property to serve public need." As has been said, recently, by a practical business man of exceptional experience and success, "profit must be a mere by-product of service." Another has said: "American business men are thinking in terms of the common good in a greater degree than ever before. This is not because they are morally better than their forefathers, but because the progress of the world compels it."

In other words, the further advancement of progress demands that utilities render the highest type of service at reasonable rates. At the same time they must promote common sense and goodwill as by-products and earn enough profit to expand and improve the business.

If there is any such thing as "Telephone Economics," then there must also be such a thing as "Mining Economics." And a mining economist could not rightfully claim to be practical, if he refused to deal with the causes of such miners' wars as have occurred in Virginia, Pennsylvania, Ohio. Michigan, Illi-

nois and Colorado. The economist who objected to judging either privately-owned or publicly-owned utilities upon the single test of quantity, quality and cost of service said:

> All concerned will be most quickly and most permanently satisfied with that kind of ownership and operation which in actual practice keeps the leaders of the utilities and the buyers of their service in closest sympathy and heartiest goodwill toward each other.
>
> In my opinion the final basis for comparing and determining the relative values of private and public ownership will be something like this:
>
> To what extent has either of them helped or hindered the advancement of the right kind of character in the individual citizen and in the body politic? To what extent has either of them helped or hindered the forces which advance goodwill among men?

55. *Necessity of Standardization of Goodwill.*—Standardization of common sense and goodwill is more necessary than the standardization of plant, equipment or practice. It is more necessary than profits or return for the use of the property. For, unless a utility is supported by the common sense and goodwill of the people as a whole, it stands a very poor chance of ever earning profit, permanently. If it does not earn enough to pay back to its investors 100 cents on the dollar, with all accrued interest, it has not earned any return at all.

Through various quotations it has been shown that a telephone plant is not a complete machine, to be worn out, and, after a time, thrown away and replaced by a new one. It is not like a carriage or automobile, in this respect. On the contrary, a telephone plant is "an ever-living organism, always growing in size and usefulness." In like manner the spirit and purpose of the people is "an ever-living organism," always growing or decaying, always advancing or retreating. Like the telephone plant, the spirit and the purpose of the people—the general common sense and goodwill—"must incorporate into their structure that which is new and necessary." Like the successful telephone plant, common sense and goodwill must "eliminate the obsolete, the wornout and the 'used up'."

A telephone plant must be "kept permanently in a condition of full vigor and at the highest attainable efficiency, anticipating the ever-growing needs of the service and responding successfully to the always-increasing requirements of the public."

Telephone men know full well, also, that all this must be done just as nutrition builds up and as absorption carries away the "used up" particles of the human body. And all this must be done without interfering with the health or work of the body or plant. It is well understood that in order to anticipate the ever-growing needs, and to respond successfully to the always-increasing requirements, "large sums must be expended in the scientific, engineering, experimentation and development work"; and that it is this scientific, engineering, experimentation and development work "which constitutes the process of standardization." So far as plant service and matters of that sort go, it is recognized that "standardization does not mean a standing still; but it does mean unceasing effort, continually improving and upbuilding." In the opinion of the author, there could scarcely be a more perfect setting forth of what is needed for the standardization of common sense and goodwill among the people as a whole.

No less an authority than the president of Columbia University has been quoted to show that "scholarship, alone, is plainly useless as a guide to conduct." Our schools are not pretending to perform the work of standardization of common sense and goodwill that is needed for the safeguarding of our utilities. Neither are our churches pretending to reconcile the common sense and goodwill of the people to the utilities. Nevertheless, there is fully as much need of a "process of standardization" for the maintenance and advancement of the spirit and purpose of the people with regard to utilities as for the maintenance and advancement of the telephone art. Unless common sense and goodwill are standardized—unless there is a "standardization that is not a standing still"—neither public ownership, nor private ownership, will provide funds for extensions and improvements.

As has been stated previously, President Vail, of the American Telephone & Telegraph Co., has said: "No matter what the political, commercial, or practical requirements may be . . . . economic laws cannot be ignored." If perfecting the permanency of the going-concern element of the telephone business is the purpose of telephone standardization, should not perfecting the permanency of the going-concern element of the public's spirit and purpose be the object of social standardization? The constant advancement of the civic conscience, civic intelligence and civic sympathy, is more important, if possible, than the constant advancement of the department which standardizes the telephone art. It is worthy of more time, more talent and more treasure, if it should be found that more is needed.

Economic laws cannot be ignored. Economic law requires the telephone industry and every other industry to "respond successfully to the always-increasing need of the people for advancement of the right kind of character in the individual and in the body politic."

It is said that "peaceful enjoyment in the use of essential apparatus is a necessity of the development of the telephone art," and every telephone man knows that the statement is true. It is fully as true and more important also, that peaceable opportunity to use the equipment is a necessity. It is easy to see that it would be hazardous to neglect "the process of standardization" of the equipment. It is also becoming plainer and plainer from year to year that it is more hazardous to neglect the standardization of the spirit and purpose of the public.

(*To be Continued*)

A Clever Telephone Advertisement.

The Rochester Telephone Co., of Rochester, Ind., is addressing the men through an advertisement that is cleverly worded to interest women to an even greater degree. It reads:

"If you were a woman and it costs only 3⅓ cents a day to have a telephone in the house, what would you do?"

The rest of the reading matter has to do with the telephone advantages as everybody knows them, described in a chatty "me-to-you" style. The advertisement ends, "You know what you would do. You'd have a telephone just as soon as the fellows who know how could put one in. Then you'd be happy and safe and up-to-date."

Telephone Managers' Meeting at Fowler, Ind.

At a meeting of the Benton Telephone Association held recently at Fowler, Ind., managers of 15 different exchanges were present. At this meeting the association adopted a constitution and by-laws. The association is for the mutual benefit of the managers in the solution of problems of service and management. Another meeting will be held late in May at Boswell, Ind.

Problems Involved in Maintaining A Clear Telephone Line

Causes of Interference Between Power and Telephone Lines—Protection from Foreign Currents Due to Physical Contact, Leakage, and Electrostatic and Electromagnetic Induction—Paper Read Before Canadian Independent Telephone Convention.

By W. J. Herdman

The great extension and multiplication of power transmission lines of late years has intensified the interest of the telephone fraternity in the problem of lessening the disturbance to telephone lines which power lines cause when the telephone lines and power lines are in close or relatively close proximity. The difficulties of the problem of maintaining a clear telephone line under such conditions is especially felt by those responsible for rural telephone lines as it is often prohibitive from the standpoint of cost to provide for a rural line that high degree of supervision and maintenance that is a requirement for a continuously quiet line. Usually the rural line is not a trunk line, but is more often a party line, and as such may have a relatively great number of telephone instruments connected thereto. As each of these substations may be a means of disturbing the balance of the telephone line through grounds, broken joints, leaks in drop wire, etc., it is obvious that the work of properly supervising and maintaining such a line is vastly increased over that necessary for a single trunk line.

Interference between power lines and telephone lines may be classified as follows:

(1) Physical contact.
(2) Leakage.
(3) Induction—
  a. Electrostatic.
  b. Electromagnetic.

Physical Contact.

This type of interference occurs more often when telephone and power wires are carried on the same poles or at points where telephone and power lines cross. It is generally due to the breakage of the wires of one service and their subsequent falling into contact with the wires of the other service. In general it may be said that telephone and power wires should not be carried upon the same pole line, but if local conditions require such construction, then the telephone wires should be carried on cross arms located under the cross arms carrying the power wires, as the power wires are usually large and less liable to breakage than the telephone wire.

Further, the telephone lineman, who as a rule must climb the poles oftener than the power lineman, is not called upon to pass between or through the power wires to reach the telephone wires, and thus the hazard to life is reduced. At points where the wires of one service cross the wires of another service it is likewise best to have the telephone wires under the power wires, but should such construction be impossible, and it be necessary to carry the telephone wires above the power wires, a wire screen should be erected between the power wires and the telephone wires to catch any of the telephone wires which might break.

This screen is constructed in many different ways. A good type of screen can be made by placing an 8 or 10-pin cross arm upon each of the telephone poles upon either side of the span of power wires and stringing between the cross arms five or six strands of No. 12 iron wire, which are tied into corresponding pins upon the cross arms, and are afterwards laced with wire at a number of points in their span to preserve a uniform spacing of the wires. This screen should be so placed as to have a clearance of three or four feet between it and the power wires.

In cases where telephone wires cross under a long span of power wires it is best to require the power company to erect a screen between their wires and the telephone wires. In cases where there are only a few open telephone wires to cross a power lead it is sometimes expedient to dead end these open wires at the telephone poles on either side of the power line and to run twisted pair, which is carried in galvanized iron pipe, the pipe being buried in the ground.

In such construction it is obvious that the pipe should run up each pole of the span between which it extends for a sufficient distance to protect the wire from injury, and further, the ends of the pipe extending up the pole should be provided with goose necks to prevent rain water from running down the twisted pairs and into the gas pipe.

Leakage.

Direct leakage from power lines is caused by poor construction, low insulation, broken insulators, line wires accidently grounded by guys, trees touching power wires, etc., together with similar conditions in the telephone system and is a condition which is quite commonly met with in telephone practice. If the leak be from an alternating current source it is a contributary cause to a noisy telephone line, as will hereafter be explained.

The remedy for this condition is obvious, and in general it may be said that if the power circuits and telephone circuits are well insulated that a disturbance upon the telephone circuit caused by the power circuit must be inductive in its nature.

Protection From Physical Contact and Leakage.

Foreign currents on telephone wires due to physical contact with a power line or to leakage from a power line may be at any one of a number of different voltages. Currents having voltages below 550 are termed low tension currents, those having voltages above 550 and up to 3,500 are termed high tension currents, and those with voltages above 3,500 are termed extra high tension currents. A properly equipped telephone line should be provided with the necessary apparatus to eliminate the danger to life and property which the presence of these foreign currents might cause.

As these foreign currents may at any one time be low tension, high tension or extra high tension, it is necessary to provide in the telephone line three distinct pieces of apparatus to lessen life and property hazards. The means used for this purpose are the lightning arrester, fuse and heat coil.

The function of the lightning arrester is to lead high tension, and extra high tension currents, and lightning discharges to ground.

The function of the fuse is to disconnect the line from all apparatus upon the passage therethrough of current heavier than is normal on the telephone line and one that if allowed to continue might cause damage to life and proprty.

The function of the heat coil is to ground the telephone line upon the passage of current which is too small in value to blow the fuse but if allowed to be present for any considerable length of time might char the insulation on the telephone apparatus.

A properly protected magneto telephone line should, if there be hazard from power lines, be equipped at the central office with carbon arresters, fuses and heat coils, and each subscriber's substation should be provided with fuses and

carbon arresters. The fuses should always be connected between the line and the arrester in order that when the arrester has operated to ground a heavy current, the passage of that heavy current through the fuse to ground may cause the fuse to blow and disconnect the line from all apparatus on the premises; otherwise the passage of a foreign current through the carbon for any length of time might, if the current be heavy enough, result in the generation of sufficient heat to set fire to any combustible near the arrester.

Leakage currents, strictly considered as leaks, generally encounter such high resistance in the leakage path as to render them small in magnitude and insufficient to operate protective apparatus, that is, blow a fuse or heat coil, and they usually manifest themselves by causing an otherwise balanced line to become unbalanced and noisy, especially if this line parallels at any point a power line.

Inductive Interference.

Theoretically, it is possible where telephone lines closely or relatively closely parallel power lines, to so construct and balance these lines as to render them operative under any exposure to inductive influences. However, as the prevention of inductive interference requires that the wires of a telephone circuit shall each have the same resistance, inductance, capacity and the same insulation resistance, and further, that this condition of balance between the wires of the circuit shall be maintained for each circuit as a whole as well as for every short section of a circuit, it will be obvious that the practical construction and maintenance of an absolutely quiet line is one well nigh impossible.

Further, when a telephone circuit has been finally balanced so as to be quiet it is in a state of unstable equilibrium and any slight disturbance to either the power wires or the telephone wires will disturb the balance and noise will ensue. These disturbances may be leakage currents caused by tree grounds, broken insulators, low insulation, etc., on either the power or telephone line. Even changed load conditions on the power lines may affect the balance and cause noise on the telephone line. However, practice has evolved various preventative and restrictive means which may be applied to power and telephone circuits to so reduce inductive disturbance as to obtain a telephone line of commercial quietness.

The subject of inductive interference and its relief is one so exhaustive that it is impossible to discuss it thoroughly in a paper of this nature, and it is considered sufficient in order that various methods of overcoming inductive effects may be understood to give only a brief outline of the theory of induction without making any attempt to thoroughly discuss the subject.

Electromagnetic Induction.

When an electric current flows in a conductor there is set up around that conductor a magnetic flux or field. This field is considered as composed of circular lines of force surrounding the wire. The character of those lines change with every change in the current producing the lines, expanding when the current increases and contracting when it decreases.

Now if a second conductor is placed parallel to the first conductor and within the field of the first conductor, every change in the lines of the field surrounding the first conductor will cause the field to cut across the second conductor and will thus generate in the second conductor by induction an electromotive force, or in other words, it will cause a foreign current to flow in the second conductor.

The voltage of the current induced in this second conductor depends upon the field of strength, which is proportional to the current, and upon the frequency of the inducing current, the length of exposure or distance that the wires parallel and separation or distance between the paralleling wire and the inducing wire.

Electrostatic Induction.

Considered electrically, any two wires which are supported in the air and insulated from each other and the earth may be regarded as plates of a condenser, the air being the dielectric or insulating medium; similarly each wire forms one side of a condenser, of which the ground forms the other side. When, therefore, an electromotive force is applied to one of several wires, as for instance a power transmission line, the difference in potential between that wire and ground will cause an electrostatic charge to be induced on all the other wires in proximity to that wire.

If the source of energy changes or reverses, as in the case of an alternating current, the charges induced in the other wires will change accordingly. The flow of current thus resulting from these changes in static charges gives rise to what is called a charging current and this is the cause of electrostatic disturbances. The static potential induced in a conductor is independent of the length of exposure, assuming perfect insulation, while the charging currents, and therefore the disturbances, vary directly with the length of exposure.

Static disturbances vary with the frequency of the disturbing force, being, however, much greater when the applied voltage is of high frequency or contains other high frequency components. Electrostatic induction depends largely on the capacities which the conductors have to ground and to each other. Every conductor has a capacity to every other conductor in the structure, therefore, the capacity between any two wires or between any wire and ground depends to a certain extent on the other conductors in the near vicinity, hence the addition or removal of a wire on a line, or the grounding of a circuit may have an effect on the capacities of the other wires.

Magnetic induction is neutralized by equal and opposite currents in wires that are near together, and static induction is likewise neutralized when there are two disturbing wires having equal but opposite potentials to the earth, the completeness of the neutralization depending upon the closeness together of the disturbing wires as compared with their separation from the disturbed wires.

Preventing and Restricting Inductive Disturbances.

The solution of the problem presented by inductive disturbances divides itself naturally into two lines of procedure, one with reference to prevention, and the other with reference to restriction. The means of prevention naturally apply to the power systems and those of restriction apply to the telephone systems.

Prevention.

As has been said before, the prevention of electrostatic disturbances applies to the power systems, and in general it may be said that the surest preventative is to keep the power lines away from the telephone lines. If all alternating current lines were located at a reasonable distance from telephone lines there would be no such thing as inductive disturbance. However, "reasonable distance" varies with the opinions of different observers, and depends a great deal upon the character of the power circuits, and it is therefore almost impossible to fix any minimum distance or set of distances which the power lines must be from a telephone line in order not to cause disturbance.

Where it is impossible to remove the telephone wires to a distance from the power wires sufficient to eliminate inductive disturbances the insulation of the power line should be high, as a broken insulator, or wire touching the limb of a tree or any other grounded object will usually cause a leak to the ground. If there are no other grounds on the circuit one point of low insulation will raise the potential to earth of the entire circuit and upset its static balance; as a result the neutralizing effect of the two or three wires of the circuit will be destroyed and static disturbances in the neighboring telephone wires will be multiplied many times.

Further, there may be a considerable current flowing to

ground if there happen to be two grounds on a power circuit, in which case the currents in the system will become unbalanced and electromagnetic disturbances will result in the telephone line. In general it may be said that a power company should assist a telephone company by maintaining the proper insulation of its lines.

Transposing Power Circuits.

It is obvious from what has hitherto been said that the transposing of power circuits is one means of lessening the inductive disturbances to paralleling telephone lines.

In general it may be said that the wires of power lines when paralleling telephone lines should be kept as close together as is practicable, i. e., they should be on adjacent pin positions and not on different cross arms or on pins at the two extremities of the arms. On single phase circuits, which include a third or neutral wire, the transformers, taps or other leads should be so located and connected that the currents will be as near in equilibrium as possible in order that the system may be balanced.

In order that the transpositions may be effective it is necessary that all exposures to the power circuit in one of its positions be equal to the exposures in its transposed position. In locating transpositions all transformers, attachments, abrupt changes in parallelism, etc., are regarded as points of discontinuity in the parallelism and the intermediate length of line is divided by transpositions into an even number of uniform sections. If the parallelism of the telephone line is uniform the transpositions will be located equal distances apart. If the parallelism varies the separation of transpositions will be increased as the separation of the line from the telephone line increases.

The location of transformers, taps, etc., and all transpositions in the power wires serve as a basis for the location of transpositions which should usually be placed in the telephone circuit. When any of these conditions are altered it is possible that the efficiency of the remaining transpositions in both lines will be greatly reduced. Therefore, it is desirable that all points of discontinuity on a circuit shall remain unchanged after they have once been established. A transposition in a three-phase circuit consists of three partial or 120-degree transpositions; i. e., three transpositions bring the wires back to the same pins from which they start. At each transposition the wires are turned over or spiralled always in the same direction so that they will occupy successive positions in successive sections.

The transposing of a three-phase line consists of dividing the distance that the telephone wires parallel the power circuits into three lengths or some multiple of three and installing 120 degree transpositions at the ends of these lengths, the number of complete transpositions required depending upon the length of the paralleling and the severity of the disturbances.

Harmonic Disturbance.

If the prevailing note in the noise or hum of an inductive disturbance is higher than that normally to be expected from the known frequency of the disturbing current, it is a sure indication that there are harmonics in the disturbing circuit, and the power company should be asked to correct such a condition by short circuiting the harmonics at the generator or transformer. There are a number of ways of accomplishing this, and it is not necessary for our purposes in this paper to describe the methods.

Restrictive Measures.

Where interference is slight it may be overcome by balancing telephone circuits, but the neutralization is never complete and circuits which parallel power lines for a considerable distance must of necessity be more noisy than circuits that do not parallel power lines.

One of the first steps in seeking to eliminate inductive disturbances is to thoroughly canvass the telephone line for bad joints, broken insulators, tree limbs touching the line, and grounds in carbon arresters attached to the line, in order to remove all causes tending to unbalance the two sides of the circuit. Further, the resistance of the two lines should be measured and any high resistance joints tending to increase the resistance of one line over the other should be remedied. In fact, before going to the expense of cutting in transpositions to cure inductive troubles it is always wise to be sure that the telephone line is balanced, as no system of transposition will cure inductive troubles on an unbalanced line.

When a telephone circuit is well insulated it can be balanced by transpositions so that the induction on the two sides will be alike and practically none of the induced current will flow from one side to the other. When the insulation, however, becomes leaky, or one wire has a somewhat lower insulation than the other, or one wire has a higher resistance than the other, the circuit becomes unbalanced and the induced current in the two wires will no longer be equal, with the result that a strong current will flow between the wires and produce a noisy telephone circuit.

On telephone circuits exposed to induction all the regular cross talk transpositions should be checked up and any that have been omitted or incorrectly located should be corrected. If the ohmic resistance of the two sides of a telephone circuit differ much from each other it will be necessary to locate and remove this source of difference. Should this balancing and transposing not cure the induction, the line where it is exposed to the power line should then be divided into sections of as uniform exposure as possible and transpositions should be installed at the ½, ¼, ⅛, etc., points of these sections.

There should be no apparatus on or changes in either the telephone or power wires in the sections being transposed. The ends of the transposed sections should be at points where the paralleling changes, the power line is transposed or the regular telephone cross talk transpositions are located, or where apparatus loops or taps are connected to either telephone or power wires. These special transpositions need be installed only in circuits which are most seriously affected by induction unless these extra transpositions upset the cross talk balance of the other circuits on the line; in such a case it will be necessary to transpose all the other circuits at the same poles.

Where the exposure of a telephone line to a power line extends over a considerable distance better results can sometimes be obtained by an entire re-transposition of the line. Instead of having the regular cross talk transposition poles located at the usual quarter mile spacing, special short sections should be installed with the transposition poles spaced much closer together than usual. These sections should contain the regular cross talk transpositions and thus the cross talk balance between the circuits will not be disturbed. This is in effect a pushing together of the regular cross talk transpositions in order to increase the number of transpositions and thus diminish the effects of induction.

Where very serious interference is encountered the effects of induction on telephone circuits can be very greatly, if not almost entirely, relieved by carrying the telephone circuits in twisted pair wires or in lead covered cable. Where the inductive effects are caused by electrostatic inductions, this placing of the wires in a cable practically prevents the formation of induced currents if the metallic sheath of the cable be grounded.

Static disturbances on open wire telephone lines may, to a considerable extent, be eliminated by installing upon the cross arms close to the telephone wires a wire which is grounded. This only slightly neutralizes electromagnetic induction however.

After the disturbances have been eliminted from a telephone line as completely as practicable by the foregoing methods still further neutralization can sometimes be obtained by changes in the terminal apparatus. A telephone circuit can be so balanced and so transposed that even though induced currents thereon are very strong there is practically no noise. In such cases it is desirable to drain off these induced currents so as to avoid the frequent operation of protector apparatus and the danger of physical shock from contact with the live condition of the circuit.

This drainage can be effected in a number of ways. One of the best methods consists of bridging the telephone line with an impedance, the middle point of which is grounded. This drainage coil, as it is called, will very often act to lessen the noise upon the circuit. In cases where telephone lines are carried for a considerable distance upon power poles, it is sometimes advisable to connect the telephone instruments to the line through a repeating coil in order to lessen the danger of shock.

In locating a drainage coil it is preferable to connect it to the line just outside of the exposed section, although it will frequently be just as efficient if located at the terminals of the circuit. In cases where the induced currents are largely of fundamental frequency, i. e. of a frequency very different from the frequency of telephone currents, their interference with the telephone circuit can often be greatly reduced by simply bridging the circuit with a low resistance of high impedance. The high impedance of this bridge does not allow telephone frequencies to be short circuited, while its low resistance makes it an easy path for the induced currents.

Special Telephone Circuits.

A phantom circuit is essentially a four wire circuit as it uses two wires in parallel in each of its sides, and for this reason, and because the wires are usually separated quite a distance from each other, the possibilities of unbalances are greater than for a simple circuit. However, the previous directions with regard to transpositions, and balances, apply to phantoms and a phantom, upon which there are inductive disturbances should be treated as a two-wire circuit.

Grounded Drop Circuits.

The practice of grounding one side of the drop coil at the central office and ringing central secretly over one line of a party line has grown greatly of recent years, and as this practice unbalances the line through the grounding of one side it renders such a line, if it be affected by induction from a power line, noisy when the parties on the line are talking to one another.

It will be obvious from what has hitherto been said that it is almost impossible to render such a line quiet by restrictive measures, hence the inductive disturbances should be eliminated by preventative measures, or in other words, the power company should be required to effectively transpose its line in the vicinity of the paralleling telephone line, or otherwise eliminate the chances of induction.

Where the inductive disturbance of such a line is slight, it may sometimes be possible to quiet the line by the addition thereto of drainage coils.

Conclusion.

It has been pointed out that the telephone companies' means of lessening disturbances from power lines are wholly restrictive, that they cannot apply means which tend to eliminate the cause of the disturbance. Such measures may only be applied by the power companies, and in conclusion it may be said that as the telephone companies were the first in the field, and as they have designed their lines and equipment to fully meet the needs of the public which they serve, they should require the power companies when paralleling a telephone line to so design and construct their transmission and distribution lines as to eliminate, as far as is possible, the chances for inductive disturbances therefrom.

Each case of inductive interference should be made a joint problem by the telephone and power companies affected, and the power company should be required to assist in the solution of the problem.

Program for Tri-State Convention, at Memphis, Tenn.

The Tri-State Independent Telephone Association has prepared a most interesting program for its eighth annual convention, to be held at the Peabody Hotel, Memphis, Tenn., on May 21 and 22. All Independent telephone men, whether members of the association or not, are urged to attend and enjoy the hospitality that the association and the city of Memphis are preparing for this convention. The program, in full, is as follows:

Friday Morning.

9 a. m.: Meeting of the board of directors.

10 a. m.: Address of welcome, President of the Business Men's Club.

Response, Albert Parlett, Bristol, Tenn.-Va.

"Efficiency Through Co-operation," Hon. Walter C. Jones, Memphis.

President's Address, W. H. Bryant, Mobile, Ala.

Report of secretary.

Appointment of committees.

Friday Afternoon.

1:30 p. m.: "Retrospective Telephony," R. H. Polk, Memphis.

"Operating Efficiency," W. S. Vivian, secretary of the Independent Telephone Association of America, Chicago.

"Increased Revenue Through Improved Transmission," O. F. Cassaday, Chicago.

"Some Facts About the Bell Qualified Toll Line Contract," F. B. MacKinnon, secretary of the National Independent Telephone Association, Washington, D. C.

5 p. m.: "Seeing Memphis by Automobile," Guests of Business Men's Club.

6 p. m.: Visiting exhibit rooms at the Business Men's Club.

8:30 p. m.: "Jovian Rejuvenation."

Saturday Morning.

9 a. m.: "The Financial Side of the Telephone Business," J. C. Kelsey, vice-president of Telephony, Chicago.

"Against Government Ownership," Terry W. Allen, Jackson, Tenn.

"Memories and Hopes," E. B. Fisher, Grand Rapids, Mich., president of the Independent Telephone Association of America.

"Uniform Systems of Accounts as Prescribed by the Interstate Commerce Commission," LeRoy Parker, comptroller of the Ohio State Telephone Co., Columbus.

Saturday Afternoon.

1:30 p. m.: "What We are Doing in Ohio," C. Y. McVey, president of the National Independent Telephone Association, Cleveland.

Short talks by George A. Scoville, Elyria, Ohio; S. M. Heller, general manager of the Central Home Telephone & Telegraph Co., Louisville, Ky.; G. A. Joy, Elyria, Ohio.

3:30 p. m.: "Sight Seeing Trip on the Mississippi River," guests of the Electric Supply Co., Memphis.

8:30 p. m.: Theater party, guests of Electric Supply Co.

Ohio State to Start Campaign for New Business in Dayton.

A. W. Surrell, manager of the Dayton plant of the Ohio State Telephone Co., has announced that he is about to inaugurate a house to house canvass for new patrons in Dayton and the vicinity. Improvements costing $50,000 will be completed within a short time, which will increase the capacity of the plant 50 per cent.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

The answer to these questions will be found in the reading section bearing the same number. Answers are not to be sent to TELEPHONY for criticism. For the benefit of those desiring the advantages of a correspondence course, the Engineering Extension Department of the Iowa State College has volunteered to answer questions and criticize replies to questions and solutions of the problems which will be presented from time to time in connection with the course. No charge will be made for this service and the offer applies to all subscribers of TELEPHONY regardless of whether they live in Iowa or elsewhere. Correspondence should be addressed to the Engineering Extension Department, Iowa State College, Ames, Iowa.

103. What effect has the permanent magnet of a ringer upon the magnetic condition of the cores of its coils?

104. How does the alternating ringing current affect the magnetic spectrum of the ringer?

105. Explain why alternating current, as well as pulsating current, will operate the biased ringer.

106. Why is it possible to operate one biased ringer without operating others attached to the same circuit?

CHAPTER VI. The Magneto Set. (Cont'd.)

107. *Principles of the tuned ringer.* There is another very important type of ringer in common use for selective calling, which is known as the tuned ringer. For certain frequencies, it is called the harmonic ringer. In another system using a different set of frequencies, it is called the synchromonic ringer. The operation of this ringer depends upon the same principles as the standard polarized ringer we have been considering. In addition, there is another principle involved which may be outlined as follows:

In the common polarized ringer the armature has no normal position; that is to say, it may remain as it is left by the ringing current. This may be any position between one resting against the stops at either end of its travel, or hanging midway between them. As a matter of fact, there is almost always some little mechanical bias or inequality in tension that throws it either one side or the other when at rest. This bias is very weak, however, and has no effect on the behavior of the ringer when in action. Of course the biasing spring *K* in the biased ringer shown in Fig. 38 always brings the armature back to one end of its travel. Otherwise it might be left on either side in exactly the same way as the regular ringer. Now it is a common expedient to use a flat spring to return such a device to a normal position after it has been temporarily deflected. This device is utilized in the construction of the tuned ringer to return the armature and clapper to a half way or central position, equi-distant from both magnetic poles whenever the ringer is not in action. We all know that a stiff spring will return to its normal condition more quickly than a more flexible one.

The reader should fix firmly in his mind the fact that the armature and clapper of the tuned ringer are always returned to a half way or neutral position when not in action, by the action of a stiff flat spring upon which they are mounted. This spring replaces the pivot *F*, Fig. 37 of the ordinary ringer. If *any* flat spring is drawn aside and allowed to return freely to its normal condition it will, by its elasticity, vibrate to and fro until the energy stored by the original forced deflection has been expended. If this same spring is weighted at one end and that end is used as the free or vibrating end, it will be obvious that the same effect will be produced. The weighted spring, however, will vibrate to and fro much more slowly than the one that is not weighted at all. In fact, for any given combination of spring stiffness and weight, there will be found to be a definite and fixed rate per second of vibration. Other things being equal, the vibrations will be faster for the stiff spring. They will also be faster for the lighter weight. It would, of course, be possible to forcibly vibrate the weighted spring at almost any rate if a very large amount of force were applied at the end. A very small force, applied at the proper times to coincide with the direction of travel of the weight to and fro, would keep such a weighted reed, as the combination is called, in continuous vibration. This is the principle which is added to the principles governing the action of the ordinary polarized ringer.

108. *Operation of the tuned ringer.* In the tuned ringer, the weights, which are used as clappers, and the springs are so adjusted that their natural speed of vibration is definite. For any given ringer, the rapidity of vibration is the same as the speed of alternation of the ringing current to which it is designed to respond. We found in the case of the polarized ringer of the ordinary kind that, as the 20-cycle current was reversed about 40 times per second, the clapper struck the gongs 40 blows per second as long as it was under the control of the alternating magnetic field produced by the coils of the ringer electromagnet. It will be remembered that the clapper of any ringer strikes the gongs each time that the alternating current operating it is reversed. Now suppose that we have a ringer that *must* vibrate at a certain *fixed* rate of speed, if it vibrates at all. It is clear that it will not vibrate at all under the action of ringing current, unless the current is reversed at the same rate of speed as the natural and fixed rate of vibration of the armature and clapper. Current being reversed at any other speed, will pull the armature in one di-

rection when it should be traveling in the opposite. For this reason there can be no continued or vigorous vibration.

The theory of the tuned ringer is shown in Fig. 40. The different size of weights or clappers for the different frequencies should be noted. Four stations, requiring a set of four ringers

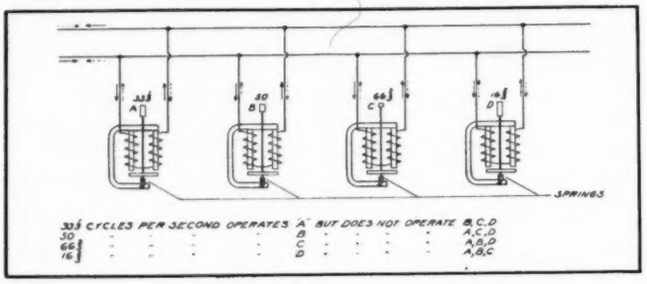


Fig. 40. Circuit of the Tuned Ringer.

on one circuit, are shown. One of these ringers will be operated by current at 16⅔ cycles per second, another at 33⅓, another at 50, and the fourth at 66⅔. When, for example, current having a frequency of 50 cycles per second is sent out on the wire, the only armature that can be thrown into vibration by it, is the one designed to have a natural rate of 50 complete vibrations per second. The other ringer armatures will be but slightly and irregularly vibrated by the current passing through their coils. The reason is that, owing to their construction, they cannot *follow* the alternations of any other frequency of ringing current.

109. *Analysis of effects of currents upon tuned ringers.* In analyzing the effects produced upon the various tuned ringers under the conditions outlined in the preceding section, assume that the current flowing on the line has a frequency of 50 complete cycles per second. We must remember that the current is therefore reversed 100 times per second. Suppose that when it is first sent out on the line and through the windings of *all* the tuned ringers in parallel, it is flowing in the direction of the solid arrows in Fig. 40. As the windings are shown in the drawing each one of the left hand poles of the ringer electromagnets will become strong south magnetic poles. Inasmuch as the lower end of the permanent magnet is a north magnetic pole, the left end of all the ringer armatures will be thrown upward. This will throw all the clappers to the right. The 33⅓-cycle ringer is constructed to make 33⅓ complete cycles of vibration per second. This means 33⅓ double swings or 66⅔ single strokes on one or the other gong. Inasmuch as the 50-cycle current is reversed in 1/100th of one second, the 33⅓-cycle ringer will be still swinging its clapper to the right when the flux in its magnetic circuit is reversed by the current which now flows in the direction of the dotted arrows. Therefore it can not start on the return swing, as its construction is such as to compel it to consume a time equal to one second divided by 66⅔ swings or 3/200th of a second for each swing. As the current that started it, only flows in the same direction 1/100th or 2/200th of a second and is then reversed, it will have the effect of stopping the 33⅓-cycle ringer in its swing to the right. This is because the flux will be reversed with the current and will tend to throw the armature back. The same course of reasoning will show that the 50-cycle current can not cause any effective or regular amount of vibration in this 33⅓-cycle ringer armature and clapper thereafter.

Now take the case of the 66⅔-cycle ringer. The 50-cycle current will likewise start the clapper of this ringer to swinging to the right. Before the current changes in direction, the ringer, owing to its construction, must be swinging *back* on its return. The effect of the current still flowing in the same direction as indicated by the solid arrows, will be to prevent this. In the same way it can be proved that the 66⅔-cycle current will not permit the clapper of any other frequency of ringer to swing far enough or regularly enough to strike its gongs. The reader should figure out the condition for each frequency of ringing current as applied to each of the ringers. It will serve to make the matter much clearer and will also fix the principles involved firmly in mind.

110. *Advantage of tuned ringers.* The advantage of the tuned ringers lies in the fact that they may be connected to the line without regard to polarity. They do not require any ground connection for four-party service, in the case of the harmonic system, or five-party with the synchromonic system. They are also surprisingly satisfactory and permanent in adjustment. In fact, almost all the manufacturers of these ringers recommend that their factory adjustment be left undisturbed. It is, of course, necessary to provide means in the exchange so that the operators may select the proper frequency of ringing current necessary to sound the desired ringer. The means of doing this will be taken up in a later chapter under the heading of "Exchange Equipment."

111. *Effect of line resistance.* In a previous installment (section 79, TELEPHONY, April 3), the principle of the induction coil was very briefly touched upon. We found that whenever there is any disturbance in the magnetic flux of the core, a current will be created in the secondary winding. This means that whenever the current in the primary is started, stopped, increased or decreased, a current tending to oppose the condition creating it, will be produced in the secondary. The first development of the telephone transmitter called for the insertion of the receivers, transmitters and battery in the talking circuit between the stations. This was a perfectly logical course for inventors to follow. The reason was because of the fact that the telegraph was the most practical method of transmitting intelligence at that time. The telegraph circuit was then, and still is, a series circuit. It was very soon discovered that, as the telegraph lines became longer and therefore of higher resistance, the results were not as satisfactory as those obtained over short lines.

In section 98 (TELEPHONY, April 24), a series of assumptions was made in regard to the change in resistance of the transmitter when in use. Let us, for the moment, apply these same assumptions to the case of two transmitters and two receivers connected in a series circuit. This is the arrangement used by

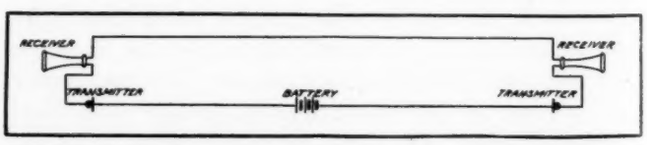


Fig. 41. Circuit of Early Telephones, a Series Circuit.

the early experimenters and is based on the standard practice in connecting telegraph circuits. The circuit is shown in Fig. 41. It is worthy of note at this time that the symbols used are the ones most often seen in schematic drawings of telephone circuits. They should therefore be fixed in mind.

112. *Relation of transmitter to resistance of circuit.* Suppose that the normal idle resistance of each transmitter is 40 ohms as before; also that the resistance of each receiver is 75 ohms and that of the circuit connecting the telephones, 10 ohms. This includes the resistance of the battery. If Ohm's law of current be applied, the following conditions will be found to exist: With the transmitters at rest or normal and a six-volt battery, there would be a current flow equal to 6 volts divided by 240 ohms or 6/240 ampere (0.025). That is, the total resistance of the circuit which is equal to the sum of the resistances of both transmitters, both receivers and the line and battery or 240 ohms, will, with a six-volt battery, permit a flow of 6/240 of an ampere. Now assuming as before that, when the diaphragm of the sending transmitter is forced inward by the sound waves, its resistance will be decreased to 30 ohms, it will be clear that the current flowing in the circuit will then be equal to 6/230 of an ampere (0.026). But, when the sending transmitter diaphragm is drawn outward increasing its resistance to 60 ohms, the current in the circuit will be 6/260 of an ampere (0.023). These results may be tabulated as follows:

Condition of Diaphragm	Circuit Resistance	Volts	Amperes	Variation	Per Cent.
Normal	240	6	0.025		
Inward	230	6	0.026	0.001+	4
Outward	260	6	0.023	0.002—	8

It must be remembered from the discussion of the receiver, that the diaphragm of the receiver is under constant tension. In the case of the series circuit now under discussion, the tension of the diaphragm of both receivers would be increased by the increase in magnetic pull due to the normal current flowing through the receiver coil windings. It is also clear that each variation in this current would decrease the magnetic pull on the receiver diaphragm, or increase it, depending upon whether the normal current became stronger or weaker. The greater the percentage of variation in the current, the greater the effect on the receiver diaphragm. The more pronounced the effect is on the receiver diaphragm, the louder will be the reproduced sound.

Having this fact clearly in mind, let us examine the effect produced on this variation in pull on the receiver diaphragm, caused by the action of the transmitter, when the line circuit is extended to such a length as to show a total resistance of 500 ohms exclusive of the instruments. Assuming that our transmitter remains normal and measures 40 ohms, we find a current in the circuit under normal conditions equal to 6/730 of an ampere (0.0082). When the transmitter influenced by sound waves presents a high resistance of 60 ohms, under the same arbitrary assumption used before, the current in the circuit would be 6/750 of an ampere (0.0080). With the low transmitter resistance of 30 ohms due to the effect of sound waves, the current would likewise be 6/720 of an ampere (0.0083). These results may be tabulated as follows:

Condition of Diaphragm	Circuit Resistance	Volts	Amperes	Variation	Per Cent.
Normal	730	6	0.0082		
Inward	720	6	0.0043	0.0001+	1.2
Outward	750	6	0.0080	0.0002—	2.4

It can be very readily seen that a variation of the transmitter resistance amounting to the same number of ohms and caused by the same sound wave, would produce a variation of 12 per cent. in the current in the receivers when the connecting circuit measures 10 ohms. The essential thing to note is that this *same* variation in the transmitter resistance would produce a variation of only 3.6 per cent., when the total resistance of the connecting circuit is *increased* to 500 ohms. Another important point for the student to observe is that this condition would not be remedied by any change in the battery voltage used.

In other words in a series circuit of this kind, the same sound wave would be reproduced much less strongly over a circuit of 500 ohms than it would be over a circuit of 10 ohms. This is true although the same transmitters and receivers are used in both cases.

It was found, as a practical result of these conditions, necessary to place the transmitter battery in a local circuit. By this means, the relatively high circuit resistance could not neutralize the effect produced by the transmitter. This does not apply to the highly satisfactory common battery telephones in which the transmitter and receiver are placed in series. The elements of the circuits in all common battery switchboards are so arranged as to eliminate this condition.

(*To be Continued*)

The Telephone Development in Chicago.

In a special issue of the Chicago Evening Post, commemorating its twenty-fifth anniversary, the story was told of the marvelous telephone development in Chicago. In 1877, six years after the great fire, the Chicago Telephone Co. commenced operation with ten subscribers; today it has 388,235. From the beginning the growth of the telephone system in Chicago was remarkable.

In 1880, three years after the first telephone had been installed, there were 1,000 subscribers, or one to every 500 inhabitants; in 1890, 8,000 subscribers, or one to every 143 inhabitants. From that year until the present time the number of subscribers has increased with almost incredible rapidity, as shown in the following table:

Year.	Number of Telephones.	Year.	Number of Telephones.
1890	7,766	1903	101,187
1891	9,043	1904	117,893
1892	10,427	1905	143,223
1893	11,408	1906	170,834
1894	12,049	1907	202,681
1895	13,869	1908	230,952
1896	15,384	1909	207,719
1897	16,909	1910	239,083
1898	21,188	1911	268,383
1899	27,663	1912	308,177
1900	36,414	1913	348,417
1901	53,511	1914	382,133
1902	79,043	1915	388,235

The figures from 1890 to 1908, inclusive, represent Chicago, city and suburban; for 1909 and all subsequent years, the number quoted represents stations within the city of Chicago, so that the increase for the last five and a half years is in even larger ratio than the figures would indicate.

The 388,235 telephone stations in Chicago are six times as many as in all of Africa, eleven times as many as in Spain, four times as many as in Italy, one and one-third times as many as in France, almost as many as in the entire continents of South America and Asia combined, and more than nine-tenths as many as in the Dominion of Canada.

An average of 2,032,000 calls are handled daily in Chicago, by 5,261 efficient operators. This average exceeds the daily average number of calls in New York City by 167,184, although that city has 34,000 more telephones.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision of Telephone Companies, Decisions of Courts in Matters Affecting Public Relations of Utilities and Actions of City Councils Bearing Upon Franchises, Rates and Service

Physical Connection Ordered at Milbank, S. D.

A decision of unusual importance was recently handed down by the South Dakota Railroad commission in the ordering of a physical connection between the Dakota Central Telephone Co. and the Grant County Telephone Co., claimed to be a branch of the Tri-State Telephone & Telegraph Co., of St. Paul, in the city of Milbank, S. D.

The order provides that this connection shall be made within 60 days by the establishment of three trunk lines between the two companies' local offices, the expense of the trunk lines, together with the connections, to be borne by the Grant County company, although the actual work of making the connection between these trunk lines and the instruments of the Dakota Central company shall be made by employes of the latter company.

Following the establishment of this connection, the Dakota Central company shall permit subscribers of the Grant County company to receive or transmit long distance or toll messages from the telephone instruments installed in their respective places of business or residences at the regular toll tariff rate in effect with the Dakota Central's own subscribers in the city of Milbank. The Grant County company shall guarantee, collect and turn over to the Dakota Central company all toll charges originating on its line, reversed messages being considered as originating on such line.

Since the Grant County company was granted a franchise in 1905 there has been no end of controversy over this question. The Dakota Central company has opposed the connection on the grounds that the Grant County company is controlled by the Tri-State Telephone & Telegraph Co., and that connecting with the Grant County company would tend to confiscate the property of the Dakota Central company at Milbank.

Its subscribers, it was believed, were held principally because of the long distance service obtainable over the Dakota Central lines, and if a connection were made its subscribers would discontinue their telephones and become subscribers of the Grant County exchange.

Hearing in Maryland Telephone Investigation.

Development costs, including the expense of getting business, took up the greater part of the recent session of the Maryland Public Service Commission, which is investigating the affairs of the Chesapeake & Potomac Telephone Co. for rate-making purposes.

Prior to the presenting of testimony the counsel engaged in a debate as to the method of procedure, in the course of which it was made plain that the figures of reproduction cost of the company's property would, when completed, be followed by the original cost, and that the commission would not have to accept either, but might take what it considered a fair valuation of the property.

The reproduction cost of the property which Osborne I. Yellott, people's counsel, is now trying to establish, is based on the theory that the company's entire property in the state of Maryland would have to be reproduced in a period of five years, whereas it actually was built up in a period of 33 years. All the figures thus far presented in the investigation have been based on this theory, though it is accepted that the original cost was much less.

In the course of the discussion it was stated by counsel for the telephone company that the company did not intend to add, or attempt to add to its claims for reproduction cost, the deficits that had occurred in the early years of the company's history. These deficits, it is the understanding, are to be considered as part of the original cost of the property.

Prospects Bright for Massachusetts Telephone Inquiry.

By a roll-call vote of 110 to 98 on April 29 the Massachusetts House passed to be engrossed the resolve appropriating $15,000 for an investigation of telephone rates and service by the public service commission. A strenuous effort was made to kill the resolve, Representative Robert Washburn, of Worcester, opposing it, on the ground that the New England Telephone & Telegraph Co.'s prosperity has made it the object of attacks. The committee on ways and means recently sent in an adverse report relative to the appropriation, but the House refused to accept the negative recommendation.

It was understood that even though the legislature had failed to grant the necessary appropriation, the commission would make an investigation on its own behalf, as it is empowered to do by the statutes. But the probability of the appropriation's becoming a reality is now very strong, and if the resolve goes through, the board with the assistance of its telephone and telegraph bureau will be able to make use of expert testimony which would be unavailable under present conditions. There is a strong public sentiment developing in behalf of an inquiry, which is likely to lead to extended consideration of the payments by the New England company to the American Telephone & Telegraph Co. for instrument rentals, engineerings, legal services, etc.

City Not Entitled to 3 Per Cent. of Gross Receipts.

The city is not entitled to 3 per cent. of the gross receipts of the Federal Telephone & Telegraph Co. for the years 1909, 1910 and 1911, and the company does not have to furnish the city with free telephones any longer, according to a decision recently handed down by Justice Bissell in the action of the city of Buffalo, N. Y., against the Federal company, which was tried before him in February, 1913.

The action was started by the city on the grounds that it was entitled to 3 per cent. of the gross receipts of the company for the three years after the Federal company had taken over the franchise of the Frontier Telephone Co., there being an agreement between the city and the Frontier company to that effect.

It is said the amount involved is approximately $36,000.

The Federal company refuted the claims of the city, contending that the New York Telephone Co. had no such agreement with the city and was not paying 3 per cent. of its gross receipts. Justice Bissell holds that in allowing the New York company to operate with such advantages is both unfair and unjust.

Penalty for Failure to Make Prompt Payment.

The Oregon Railroad Commission recently rendered a decision in the application of the Oregon-Washington Telephone Co. of Hood River, Ore., for permission to make an increase of 25 cents per month in its rates for all classes of service within the state, upon the understanding that a discount of 25 cents will be allowed from the increased rates if the subscriber's account is paid in full on or before the tenth of the month for which the service is billed.

According to the company's rate regulations, all monthly service rates are payable in advance. At the present time no discounts are allowed and no penalty is imposed for failure to pay bills promptly. The commission held that a utility is entitled to make rules providing a reasonable penalty for failure to pay bills by a time specified. The penalty in this case, it was held, should be approximately 10 per cent. of the net bill, with enough added to avoid fractions and make the cents end with 0 or 5, with 25 cents as a maximum. The gross bills for the various classes of service of the Oregon-Washington company, as ordered by the commission, are as follows:

	Gross Bill.	Discount.	Net Bill.
Main line business	$3.50	$0.25	$3.25
Party line business	2.50	.25	2.25
Main line residence	2.50	.25	2.25
Party line residence	1.65	.15	1.50
Ministerial rate, party line residence	1.10	.10	1.00

In each case the net bill specified is the present rate. This order became effective May 1.

Boarding House Keepers Allege Discrimination in Rentals.

A complaint of alleged discrimination by the Chesapeake & Potomac Telephone Co. in the matter of maintaining slot machine telephones was recently filed with the Public Utilities Commission of the District of Columbia by Attorney Charles C. Miller on behalf of Mrs. F. L. Harward, and Mary E. Cosdon.

The complainants state that they are charged an annual rental of $30 for maintaining slot-machine telephones in boarding houses which they conduct, whereas hotels and drug stores are not charged anything for the same service, but, on the contrary, are given royalties for permitting the telephones to be installed. The practice is declared to be unfair and discriminatory and the utilities commission is asked to investigate it.

Ruling Relative to Advertising in Telephone Directories.

An order has been issued by the Nebraska State Railway Commission covering the printing of advertisements by telephone companies in directories.

A complaint was made by Representative Stebbins of Dawson county against the Gothenburg (Neb.) Telephone Co. for its manner of inserting advertising in the directory published by it. The complaint stated that the advertisements were inserted in the center of the pages and thus the names were separated and, according to the complaint, made it difficult to find the names needed.

The order comes as an agreement entered into and specifies that advertisements may be placed at the top and bottom of pages not to exceed one-inch in depth so that the names of subscribers all appear together on the page.

Same Rate for Desk and Wall Telephones.

The same rate must be charged by the Norman (Okla.) Telephone Co. for a desk telephone as for a wall telephone, according to an order recently issued by the Oklahoma Corporation Commission. It is pointed out that the cost of maintaining a desk telephone is so little more than for a wall telephone that there is no reason in making a higher rate for one than the other. The telephone company is also required to improve its service, as complaints have been received by the commission from a number of subscribers in Norman that the service rendered them is unsatisfactory.

Rate Increase Granted to Smaller Wisconsin Companies.

That the smaller telephone companies in Wisconsin are not making reasonable returns on their investments is evidenced by the large number of applications made by them to the state railroad commission for authority to increase rates and the favorable action taken on such petitions by that body. Last week the commission granted permission to raise rates to the Colfax Telephone Co., of Colfax; the Sandusky Telephone Co., of Washington, Sauk county; the Morris Telephone Co., of Morris, Shawano county, and the Cameron Farmers' Telephone Co., of Cameron.

Rates for rural line service were raised in most cases from $8 to $10 or $12 per year, and for village line service from $12 to $16 or $18 per year. Rates for single messages over rural lines were raised from 5 cents to 10 cents, and over two lines from 15 cents to 25 cents. These rates are for limited distances.

Contracts Signed for Use of Conduits in Toledo.

Both the Central Union Telephone Co. and the Ohio State Telephone Co. have signed contracts agreeing to the rates set by Toledo, Ohio, city council in 1913 for the use of the conduits on the million-dollar Cherry street bridge. The matter has been in abeyance for the past two years but Service Director Boardman set the ball rolling by declaring that the contracts must be signed and the rental paid including the back rental from April 1, 1913, or the wires would be removed from the bridge. The rental rates are seven cents a duct foot for the conduits used and three cents a duct foot for those reserved. The Bell company is using three conduits and reserving three, while the Ohio State company, is using one and reserving one.

City May Control a Company by Ordinance.

Conviction of the Montana Independent Telephone Co., of Butte, Mont., and Frank E. Farwell, its manager, for violating an ordinance requiring the placing of all wires in underground conduits, was held proper by the state supreme court, in an opinion recently handed down by Associate Justice William Holloway, affirming the judgment and order of the Silver Bow county court.

The company and its manager appealed from an order denying them a new trial, on the theory that the authority to prescribe regulations for the conduct of the telephone and telegraph business is vested in the legislature.

Company Justified in Demanding Advance Rental.

That the Newark (Ohio) Telephone Co. was justified in demanding payment for use of telephones in advance and in penalizing patrons for non-payment of rental was the ruling of City Solicitor Norpell, who quoted from the United States Supreme Court decisions in his report to the city council last week. He declared that the Ohio Public Utilities Commission has jurisdiction in the matter and that the company is justified in employing the new rules recently put into effect. The report was accepted.

Rate Schedule for Crawfordsville, Ind., Approved.

The Indiana Public Service Commission has approved the following schedule of rates to be charged by the Central Union Telephone Co. in Crawfordsville, Ind.: Individual business service, $3 a month; individual residence service, $1.25 a month, and rural service, $1.25 a month.

Summary of State Commission Hearings and Rulings.

CALIFORNIA.

May 18: Hearing in regard to complaints against the Pacific Telephone & Telegraph Co., at Sacramento, Cal.

DISTRICT OF COLUMBIA.

April: Complaint filed by Mrs. F. L. Harward and Mary E. Cosdon, of Washington, D. C., against the Chesapeake & Potomac Telephone Co., alleging discrimination in the matter of maintaining slot machine telephones. The complainants allege that they are charged $30 per year for maintaining slot machine telephones in boarding houses which they conduct, whereas hotels and drug stores are not charged anything for

such service but are given royalties for permitting the telephones to be installed.

INDIANA.

May 1: Order authorizing the Southern Telephone Co. of Indiana to issue $1,870,000 worth of stock, of which $1,791,500 is to be used to pay for the appraised value of the properties of the Cumberland Telephone & Telegraph Co. in southern Indiana and $78,500 as working capital of the company.

May 1: The Citizens Telephone Co., of Kokomo, Ind., has filed an application with the public utilties commission for permission to issue $25,000 in notes for the purpose of making improvements to its system.

KANSAS.

April 1: Order consolidating the application of the Northeast Kansas Telephone Co. for permission to charge all patrons uniform toll rates between Horton, Kans., and towns named, with the application filed under Docket No. 993.—1010.

April 5: Order dismissing the complaint of George Schaefer against the Emporia (Kans.) Telephone Co.—1026.

April 5: S. P. Smith, granted permission to sell his telephone plant and property at Allen, Kans., and vicinity to J. H. and H. C. Pace.—972.

April 9: Spivey (Kans.) Telephone Co. authorized to increase its switching fee to 35 cents per telephone per month, to be paid quarterly in advance.—1012.

April 12: The commission approved the sale by Asa Cooper of his telephone plant and property at Burden, Kans., and vicinity to W. A. Cales.—1021.

April 16: Application of the Hardtner Rural Telephone Co. for a certificate of convenience and authority to transact the business of a telephone company at Hardtner, Kans., dismissed, the company having later filed a request that the original petition be dismissed.—1014.

April 26: W. A. Cales authorized to issue his note in the amount of $4,000 due in two years from its date, to draw interest at 7 per cent., to be secured by lien on the telephone property recently purchased from Asa Cooper, the note to be used as part of the purchase price from Mr. Cooper.—1038.

May 5: Hearing on application of the Baxter Telephone Co., of Baxter Springs, Kans., for permission to increase rates.

MISSOURI.

May 1: The commission granted the application of Killan Brothers, of Marshfield, Mo., to sell the property of the Webster County Telephone Co. at Marshfield to Messrs. Frantz and Garst, of Conway Springs, Kans.

NEW YORK.

May 5: Hearing in regard to the complaints of the city of Cohoes, N. Y., the Business Men's Association and Board of Trade of Cohoes, the village of Waterford and the city of Watervliet against the New York Telephone Co. and the American Telephone & Telegraph Co. as to rates.

OHIO.

April 28: Elyria Telephone Co., of Elyria, Ohio, authorized to issue its common capital stock of the total par value of $61,000, $54,000 of the stock to be distributed, pro rata, to the holders of its present outstanding capital stock in lieu of moneys heretofore expended from income for the construction, completion, extension and improvement of its plant and facilities and the proceeds of the sale of the remaining $71,000 be used in payment of its floating indebtedness.

May 3: Middlepoint (Ohio) Home Telephone Co. authorized to issue its common capital stock of the total par value of $3,545 for distribution among the holders of its present outstanding capital stock in lieu of moneys heretofore expended from income, for the extension and improvements of its facilities. The petition of the company to issue $4,199.45 common capital stock, making a total issue of $7,747.45, was dismissed by the commission.

May 4: Northwestern Telephone Co., of Defiance, Ohio, authorized to issue its common capital stock of the total par value of $35,000. Of the proceeds from the sale of this stock. $26,500 is to be used to pay outstanding notes, $6,888 for the reimbursement of the company's treasury for moneys expended for construction and the remainder is to be used for the construction of additions and extensions to the company's rural lines.

May 4: Buckeye Pipe Line Co. authorized to sell and convey to the Central District Telephone Co. 19 poles located partly upon a public highway and partly upon private property in the township of Cross Creek, Jefferson county, Ohio.

OKLAHOMA.

April: Order directing the Norman (Okla.) Telephone Co. to replace worn out equipment and give improved service to its subscribers. The company is also directed to charge the same rate for desk telephones as for wall instruments. The difference in the cost of maintenance and operation was insufficient to justify a difference in charge, the commission held.

May 3: Postponed hearing in regard to complaints of Independent telephone companies of Oklahoma, charging that the Pioneer Telephone & Telegraph Co. is making threats or actually removing its toll line connections as a means of forcing the complainants to sign contracts for a division of long distance receipts more generous to the Pioneer than the Independents agree to concede.

OREGON.

April: Application filed by the McMinnville (Ore.) Local & Long Distance Telephone Co. for permission to charge adequate switching rates, as the company claims its revenue is so small as to make it impossible to make adequate improvements to handle the large volume of business with several mutual companies and the Pacific Telephone & Telegraph Co.

April 23: Petition filed by the Pacific Telephone & Telegraph Co. for permission to discontinue its exchange at Flanagan, Wasco county, Ore., its one subscriber in that town having discontinued his service in January.

April 23: Petition filed by the Pacific Telephone & Telegraph Co. for permission to discontinue its exchange in Rickreall, Polk county. Ore., its subscribers having organized the Rickreall Rural Telephone Co.

April 23: The Coquille Valley Telephone Co., of Coquille, Ore., has petitioned the commission for permission to raise its rates at Myrtle Point. The proposed new rates are as follows: Business, one-party, $3; two-party, $2.50; three-party, $2.25; residence, one-party, $2.50; two-party, $2; four-party, $1.75. The old rates are: Business, one-party, $2; five or more, $1.50; residence, $1.50.

April 24: Order authorizing the Oregon-Washington Telephone Co., of Hood River, Ore., to impose a penalty upon its subscribers for failure to pay rentals by a specified time, effective May 1.

PENNSYLVANIA.

April: Complaint filed by the Commonwealth Telephone Co., which operates in Lackawanna and Luzerne counties, Pa., against the Merchants' Telephone Co. on the ground that on its competing lines it is offering ruinously low rates and that it has crossed its lines without any authority from the commission.

WASHINGTON.

May 15: Hearing on the valuation of the properties of the Pacific Telephone & Telegraph Co. in the state of Washington. On the valuation to be fixed, as a result of this hearing, telephone rates, both for exchange and toll service, will be based.

WISCONSIN.

April 29: Order dismissing the case of the Eleva (Wis.) Farmers' Telephone Co. vs. the Mondovi (Wis.) Telephone Co., the action arising under the anti-duplication law. An agreement is being sought which obviates the necessity for an order regarding the question of duplication of lines. Continuous service will be furnished by the Eleva company, so that there is no occasion for an order relating to continuity of service. Both companies recognize the necessity of having a second line, and the Eleva company has its portion of the line already constructed, and the Mondovi company will build its portion, so no order is held to be necessary in this case.

May 1: Order authorizing the Cameron (Wis.) Farmers' Telephone Co. to increase its rural rates from 50 cents to 75 cents and its village rates from 75 cents to $1.

May 1: Order authorizing the Morris (Wis.) Telephone Co. to increase its residence rates from 50 cents to 75 cents per month and business rates from $1 to $1.25.

May 1: Order authorizing the Sandusky Telephone Co., of Lime Ridge, Wis., to increase its rates from $10 to $12 yearly.

May 1: Order authorizing the Colfax (Wis.) Telephone Co. to adjust its rates for making replacements.

May 4: Hearing at Dalton, Wis., in regard to investigation, on motion of the commission, of the quality of service furnished by the Kingston Telephone Co. Complaint of R. Sims, et al. U.—731.

May 12: Hearing in regard to application of the Pigeon Valley Farmers Telephone Co., of Pigeon Falls, Wis., for authority to increase rates, tolls and charges. U.—782.

May 13: Hearing in the case of Peter B. Bogart, et al., vs. the Wisconsin Telephone Co., as to rates. U.—341.

May 14: Hearing in regard to application of the Ettrick (Wis.) Telephone Co. for authority to increase rates. U.—787.

May 19: Hearing in regard to application of the Lebanon (Wis.) Telephone Co. for authority to increase rates, tolls and charges. U.—786.

May 27: Hearing in regard to application of the Random Lake (Wis.) Telephone Co. for authority to increase rates, tolls and charges. U.—789.

Practical Subjects—Letters and Discussions

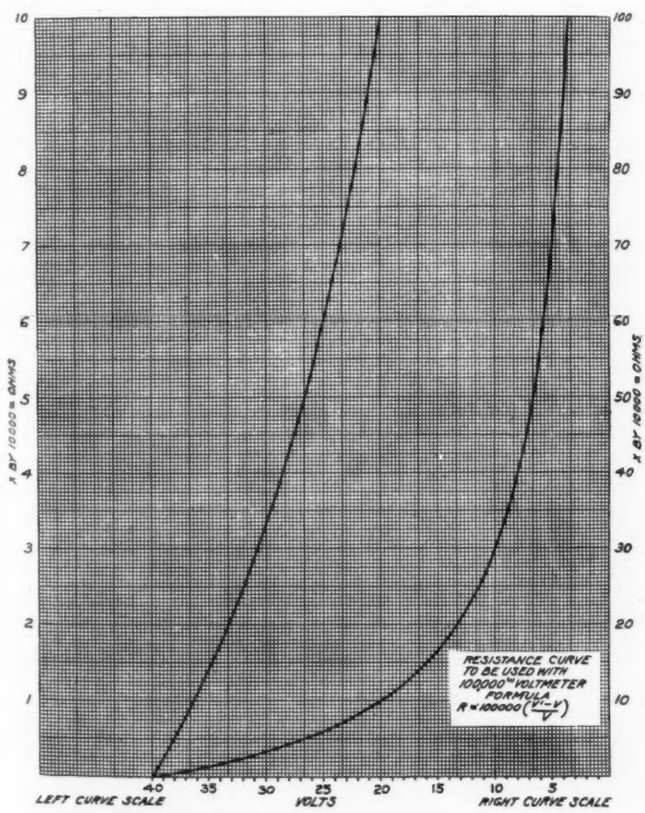
Unique Advertising Campaign of Federal Company.

A very unique and original advertising campaign has just been instituted by the commercial department of the Federal Telephone & Telegraph Co., of Buffalo, N. Y. It consists of a contest, open to the pupils of every school in Buffalo, for the best composition on the "Use and Advantages of the Automatic Telephone." A prize of $25 is offered for the best article containing not more than 1,000 words, submitted by a pupil in the ninth grade. A similar prize is offered for the best article submitted by a pupil in the eighth grade, and another prize for the best article offered by a pupil in the seventh grade.

The company has invited all the children to visit its new exchange, accompanied by a teacher, for the purpose of seeing the automatic exchange in operation. The purpose of this campaign is to enlighten the school children—the future citizens of Buffalo—as to the operation, advantages and usefulness of the automatic telephone system and to familiarize them with the details of the work.

Resistance Curves for Use with Voltmeter.

Every wire chief and telephone man is familiar with the use of the voltmeter for testing purposes in locating grounds and crosses and for determining resistances of various coils and lines by using the formula R=resistance of voltmeter multiplied by the difference between the reading of meter across battery


RESISTANCE CURVE TO BE USED WITH 100000 Ω VOLTMETER
FORMULA
R = 100000 (v1 − v / v)
LEFT CURVE SCALE
VOLTS
RIGHT CURVE SCALE
x BY 10000 = OHMS
x BY 10000 = OHMS

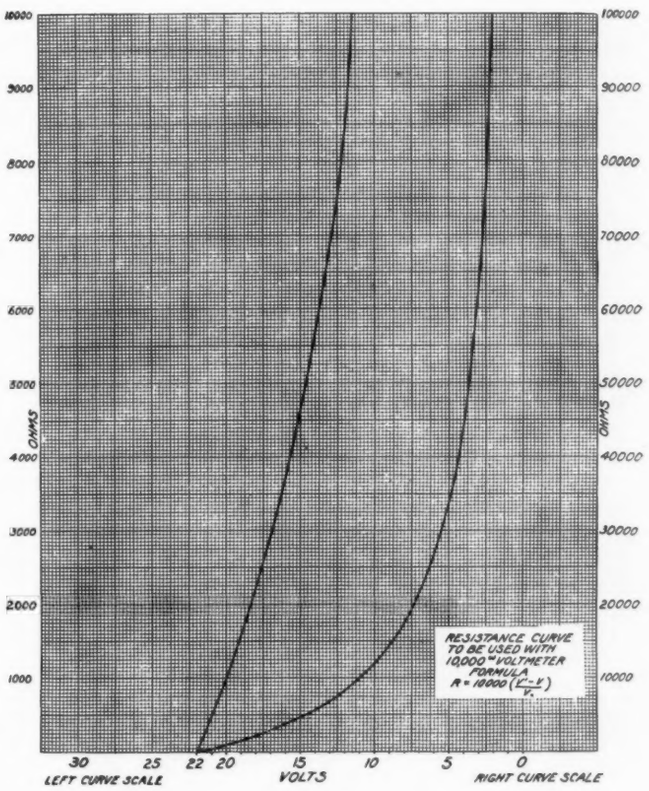
Curve for Translating Voltmeter Reading into Ohms.

and the reading of meter with resistance in circuit, divided by reading of meter with resistance in circuit.

That is: $R = r\dfrac{(v_1 - v)}{v}$.

To work out the formula for each reading takes time, and in order to make the voltmeters more useful to those who have them, the accompanying curves have been made up so that resistance values may be read directly from them.

The curves are for use with the standard Weston wire chief's voltmeters having resistances of 10,000 ohms for the 22-volt



Resistance Curve for 10,000-Ohm Voltmeter.

batteries and 100,000 ohms for the 40-volt batteries with which most of the telephone exchanges are equipped.

In cases where the voltage of the battery should not be exactly 22 or 40, suitable battery or resistance can be added or removed as the case might require. Of course one would have to take into consideration any resistance that might be added in the final reading.

Prescott, Ariz. H. Mathews.

Some Kinks From Nebraska.

A telephone man like any other person who sometimes labors away from his base of supplies, must use what material he has at hand to suit his needs. A while ago I found myself up against it in the shape of a cord tip that would not fit in the terminal. It was so small that the binding screw would not hold it in place, and the tip I had taken out was also too small so that I could not transfer them. Therefore, after turning the matter over in my mind a few times, I cut off a small piece from the cord tip, put it in the screw hole, turned the screw down and went home.

Another time when wanting paper cable sleeves several hours from any other source of supplies, I begged some "straws" from a soda fountain man. They worked fine.

These troubles that are in today and gone tomorrow, are the difficult ones to find. A subscriber persistently reported cut-out trouble that could not be located. One day a man was sent to camp at the telephone until the trouble came in. Along about 12:40 p. m., the stenographer came back from lunch and proceeded to call "Charley" for a

chat. While chatting she pulled the pins out of her hat and idly punched the stand cord with them. She turned to the troubleman indignantly, saying, "There! it cut-out."

York, Neb. Rufus Comstock.

A Letter from a Missouri Man.

A recent issue of the Southwestern Telephone News tells of a subscriber stating that it would be impossible for him to meet his telephone bill unless pigs would be accepted instead of cash. I also noticed in TELEPHONY that the people should be educated what to expect and how to treat public utilities. Therefore, I trust you will find sufficient space in your journal for the following clipped from a paper, and the comments in connection therewith:

A MONEY MAKER.

What one Poland China sow can do: The last of November, 1913, Runyan & Sons bought a bred Poland China sow for $20. Last summer she raised 7 pigs, 6 sows and 1 boar. The boar and one sow were sold for $30. Her second litter was 7 pigs, which were sold as stockers for $42. They now have 5 sows, 4 with 33 pigs and one more to farrow, and the old sow yet a pig. Figuring the sows with pigs at $20 each, and the pigs at $1 each, that lot would be worth $113; counting the other two sows at $25 each,would make Runyan & Sons' entire holdings worth $163, which, with the $72 worth of hogs sold, would total the sum of $235 in 17 months from the one $20 purchase.

I know of no question so vital to the telephone user and the people who give of their time and talent as well as to risk their means in its development, as fair play or equal justice to all. Just as certain as the earth continues to perform its customary travels in the space allotted it, even so will there come a great and terrible rebound, to the detriment of the people as a whole, from the bungling methods of reform politicians in dealing with the rights of the various utility companies. It is sheer nonsense and folly to stand idly by and permit instilling into the public mind, the doctrine that men who have taken the initiative in organizing and perfecting their particular line, in any business, should not be allowed to earn on their investment more than 6 or 7 per cent.

What is sauce for the goose ought to be sauce for the gander. Who, pray tell me, denounces the banker, charging 8 per cent., or the individual who loans his money on real estate at 40 per cent. of its market value and charges 8 per cent. with nothing for him to do but clip his coupons as the interest comes due. No! The great state of Missouri comes forward and says it is lawful for them to do this and that they will be protected by making a statute permitting them, as individuals, to do this.

Further, as a protection for the rights of the people, we are going to protect them from the capitalist by making him labor to perfect a system whereby his own and the savings of others must be employed where vast amounts of money must be spent for equipment that will depreciate every year, where the risk from storms and fire are great, where many unforeseen expenditures are constantly arising; and last, but not least, employment given to thousands of men, by making it unlawful for him to earn more than 5 or 6 per cent. on his investment. Is this justice?

As we have quoted before, the goose and gander should be dressed with the same sauce. Why then should there be any class legislation whereby one man may command any rate of return on his investment he may ask, while another is forced to accept an amount stipulated by law. Just suppose that Runyan & Sons had been required to market their hogs at a price that would not have exceeded 6 per cent. Do you suppose the farmers, as a class, would not have risen up en masse and cried "persecution"? Of course they would, and their cause would be just for the simple reason that, while they made a good profit, they at the same time assumed the risk of losing a part or all of these hogs from disease. However, I must not take up too much of your valuable space. Yet what has been written here is merely skimming the surface.

No sane person should object to public service commissions but neither should any sane person object to the application of the Golden Rule. If Smith, as a banker, and Brown, as a plain citizen, are to be permitted to charge a certain per cent. for their capital without any obligation—to employ their time and attention to the exclusion of all other affairs, as men in charge of vast enterprises are compelled to do—if as in the case of the citizen, at least, without entailing any special portion of his time and attention, he is going to be permitted to earn a greater return, where is the freedom we so grandly boast of? It's lost usually in the depths of a deceived public that is being made the fool by political reformers for their own selfish interests.

Let's have a little sense, ourselves, by giving out scientific information in every way we can. At the same time prove to the people that all the public utility wants is an equal show with the individual and that in the race it is entitled to be protected for the risk taken just as the farmer or any other man who is not held strictly to an accounting of a certain per cent. as a return on his investment.

Chas. D. Weakley, Owner
Hardin, Mo. Hardin Telephone Co.

Number of Telephone Subscribers in England.

Some figures relative to the effect of the European war upon the number of telephone subscribers in England are given in the April issue of The Telegraph and Telephone Journal. The following table gives comparative figures of the canvassing results for the six months ending January 31, 1915, and January 31, 1914, respectively.

TOTAL NEW TELEPHONE STATIONS OBTAINED.

	1915.	1914.	
London	11,809	15,700	*3,891
Provinces	19,830	27,815	*7,985
United Kingdom.....	31,639	43,515	*11,876 = 27 per cent.

*Decrease

STATIONS ORDERED OUT.

	1915.	1914.	
London	12,305	8,111	†4,194
Provinces	14,459	13,242	†1,217
United Kingdom.....	26,764	21,353	†5,411 = 25 per cent.

†Increase

NET ADDITIONS TO TELEPHONE STATIONS.

	1915.	1914.	
London	*496	7,589	*8,085
Provinces	5,371	14,573	*9,202
United Kingdom.....	4,875	22,162	*17,287 = 78 per cent.

*Decrease

Note: For purposes of comparison it has been necessary to add to the 1914 figure one week's results to make the two periods represent an equal number of weeks (i e., 27 weeks).

It will be seen from the table that despite the large number of telephones ordered out, there has been a net gain of 4,875 stations during the period under review, without taking into account some 4,000 new stations provided for naval and military requirements.

Communication Between Vancouver and San Francisco.

Telephone communication has been established between Vancouver, B. C., and San Francisco, Cal. A satisfactory conversation was also carried on recently by telephone between that city and Denver, Colo. The circuit will be extended in the near future down the Pacific coast from Vancouver as far as San Diego. It is also believed that it will not be long before communication is established between Vancouver and the Atlantic coast.

Financial Letter on Independent Telephone Securities

A Communication Regarding Plans for the Formation of a Telephone Securities Sales Organization for the Purpose of Selling Independent Telephone Securities Throughout the Country for the Benefit of the General Telephone Business

By B. G. Hubbell

A prominent international banker of New York City said to me last week: "Mr. Hubbell, I believe you are absolutely right in stating that locally-owned and locally-controlled telephone companies are best for public benefit. If you can show me that the securities of that class of telephone companies can be sold to the general public, I will buy all you have to offer. Further, you will have no trouble in interesting the large banking interests in the East in the purchase of this class of securities."

In a further discussion with this man, who is prominent in the group of international bankers, he stated that New York and other Eastern cities were rapidly learning that public utilities could reach a stage where they were too big to be sound and strong—where the cost of observation and supervision, because of extent of territory covered, was too great for the public to bear—and that in his opinion a public utility could more economically serve the interests of the public where the scope of its service was restricted and yet sufficiently comprehensive to give the largest percentage of service for the public's requirements.

I was pleased beyond measure at this statement coming from so substantial and prominent a source. I have spent a great deal of time in New York in the past several years endeavoring to convince big bankers that locally-owned telephone companies, operating in a restricted territory, have many advantages over their larger competitor, but only recently have I found a willingness on the part of large bankers to accept these views.

This favorable change in sentiment in the minds of large Eastern bankers toward independently-owned companies, and also the increasing regard of the general public for the stability of the telephone business, has led me to believe that the time is ripe for the formation of a financial agency for the purpose of proving to large banking interests that, with a favorable solicitation, the general public will buy securities of independently-owned telephone companies.

I have therefore discussed this matter with a number of my associates, some of whom are of the most important business men of the East. They have agreed to assist me in building up such an agency, provided a sufficient number of Independent companies express a desire to join in this work. I, however, want to be sure of its being received favorably before going very far with it. I recognize how difficult it would be at this time to raise any considerable amount of money for this purpose by general subscription, and am, therefore, writing a considerable number of telephone companies for their opinion of the benefits of such a plan, and to learn if they will be willing, without expense to themselves, to join in the formation of such an agency.

The Plan.

The plan will be to divide the country into districts and to appoint managers or other officials of telephone companies to the general agency of the particular district in which they reside. Where there are no Independent companies, special agents will be found.

The purpose of such a co-operative movement will be to bring into one central organization, the influences of all Independent telephone companies throughout the United States so as to be able to present to the general public, through managers, officers and directors, the true facts relating to the unusually favorable position of locally-owned and operated telephone companies. A demand for telephone securities may thus be created so that when telephone companies have issues of securities to sell, these securities can be offered through this central organization and sold by it to bankers and brokers and to the general public.

The central office of this organization, when formed, will gather and compile interesting data and literature covering all favorable telephone arguments and will distribute this information to the companies associated in this plan. Weekly bulletins will be distributed to associated telephone companies, covering important telephone literature, edited in an interesting and instructive manner. Offerings will be made of securities of telephone companies whose conditions have been favorably passed upon by the auditors and engineers of this central organization. These auditors and engineers will be well and favorably known in financial circles. No securities will be offered through this central agency which have not had their approval.

Offices will be opened in New York and Chicago and close touch will be kept with all banking interests so they may be continuously informed as to the progress of this work.

The Possibilities.

Now as to the possibilities of success: It will no doubt come to mind that many telephone companies will have securities of their own for sale and that there will be little or no opportunity of selling outside securities in such districts. I have studied this point very carefully and am firmly of the opinion that a general offering of strong outside telephone securities by local telephone managers will assist materially in the sale of their own securities when they have them to offer. It will show their subscribers and their friends that there is a broad field for telephone securities because of their being generally offered throughout the country and that, therefore, a telephone investment would be a very proper one for them to make.

There may be many people in a district who, for one reason or another, would not at present buy local securities, but who could be approached successfully by offering strong outside telephone securities. The association thus formed would make such an investor a friend of the local company and ultimately he would be one of its investors.

I think, on consideration, telephone men will readily see the tremendous benefit which will accrue to Independent companies of this country through the successful operation of a plan of this kind. They will also see the advantage to themselves in being an important factor in popularizing Independent telephone securities in this manner.

In the past twelve years I have sold more than $10,000,000 par value of telephone securities to more than 4,000 people. During the last year and a half I have been experimenting in selling telephone securities through telephone managers and, in that time, have disposed of approximately $700,000 par value of the 7 per cent. preferred

stock of the Federal Telephone & Telegraph Co. A considerable number of the telephone managers with whom I have dealt in this try-out, have made anywhere from $300 to $1,000 in commissions through the sale of this Federal 7 per cent. preferred stock.

I have found the difficulties to overcome in selling telephone securities are more particularly in convincing telephone managers that they can become good security salesmen, than in convincing the public that telephone securities are good.

I have always contended that the natural way of presenting a subject is the best and most forceful way. As no one is better able to talk the telephone business than the manager or employe of the telephone company of the town, I am sure he can make a success of selling a good telephone security where another class of salesmen will fail. It may be said that telephone managers have all the work they can do. But my observation is that, if a telephone manager will study telephone financial arguments and become well acquainted with financial statements, he will fit such knowledge to his daily work and will broaden himself and be of far greater benefit to himself and to his company than he would if he did not have that knowledge.

There will be a commission of from 2 per cent. to 10 per cent. to the agent on all sales made in his territory, and I am willing the manager of the company, or some one of the officers, shall be the general agent for the district. If it is desired two persons may be registered to act as agents in a district. The commission would then be divided equally between them.

As soon as a sufficient number of these agencies have been applied for by telephone men who are not only willing but anxious to assist in this work, the central organization will be immediately formed. The necessary data for a favorable beginning of this work will then be prepared and forwarded to the agencies.

Automatic Telephone Representatives Hold Convention.

Representatives of all the automatic telephone exchanges in Ohio and one in Richmond, Ind., were present at the annual convention of the Ohio State Automatic Telephone Association, held last week in Dayton, Ohio. This association was organized for the purpose of bringing before the various automatic companies ideas with a view of increasing the efficiency of the companies as a whole.

Before the convention was held a criticizing committee of ten delegates from Ohio spent several days in inspecting the plant and equipment of the Dayton exchange. At the meeting, they submitted their report, offering recommendations regarding the property, equipment and class of service. In addition to the report of the committee, a number of suggestions for increasing the efficiency of the plant were offered. Ways and means of increasing the revenue of the companies were also discussed.

Among those present were R. A. McClellande and B. J. Anderson, Richmond, Ind.; W. C. Ballinger, Akron; F. J. Tupp and R. H. Judy, St. Marys; H. O. Dutter, Bucyrus; F. R. Sears, Cambridge; Guy Watkins and Charles Hollander, Newark; F. B. Moody, C. A. Swoyer, H. F. Kinnel and Charles Babbert, Columbus; Seymour Hirsch, Toledo; M. B. Evans, Chicago.

In addition the officials and employes of the Ohio State Telephone Co. of Dayton, were present at the meetings.

G. A. Carlaw, of Sisseton, S. D., Wanted for Murder.

A letter has just been received from J. L. W. Zietlow, president of the Dakota Central Telephone Co., of Aberdeen, S. D., stating that G. A. Carlaw, manager of the Sisseton exchange of the company, is wanted for the murder of his wife and 18-year-old daughter at their home in Sisseton on March 13.

As Mr. Zietlow thinks it possible that Mr. Carlaw may apply for a position with some telephone company, he states that it might be well for telephone companies to scrutinize men whom they may have employed since that time, or any applicants they may interview in the future.

Enclosed with Mr. Zietlow's letter is a folder issued by J. L. Minder, sheriff of Roberts county, Sisseton, S. D., giving a complete description and photograph of Mr. Carlaw. According to this description, he is 5 ft. 10 in. in height; weighs about 180 pounds; has a dark complexion, brown eyes and black hair. He is slightly bald and slightly stoop-shouldered and is 44 years of age. When he disappeared he was smooth shaven, but it is believed that he may start to grow a mustache and beard to hide his identity. He wore a gray suit, his coat and vest having a small stripe in them, while his trousers are plain gray of a little lighter shade; a black overcoat with a beaver collar; black laced shoes with rubber heels and storm rubbers. He has a scar under his left cheek bone, which will require close examination to be noticed. He is of a quiet disposition.

Mr. Carlaw was manager of the Dakota Central company at Sisseton for the last 14 years. His accounts were left in a bad shape and he deliberately collected money in advance and the day before the murder, borrowed money from his friends and neighbors, in preparation to perpetrate this terrible act.

Mr. Zietlow or the sheriff of Roberts county will appreciate any information as to the whereabouts of Mr. Carlow.

Improvement Noted in Present Industrial Conditions.

Substantial improvement throughout the country is noted in the telephone situation. Reports from the South, which was probably more affected than any other section, indicate that the general improvement, which has followed the marketing of the cotton crop at prices normal or better than normal, has been reflected in the earnings of telephone companies. An easier financial condition is certainly obtaining in the South, as well as in every other section of the country. With a substantial curtailment of cotton acreage, as is indicated at present, the South should see a year of prosperity, according to students of the situation.

As a barometer of existing industrial conditions the telephone industry has many disciples, who are now pointing to the general improvement in telephone affairs throughout the country. Coming good times are not only evidenced in the better telephone trade, but a decided improvement has been reported in almost every industry, and a return of confidence is manifested in the easing of money everywhere.

The New York stock exchange has done away with minimum prices, which were established upon the reopening of the exchange, to guard against possible heavy liquidation and a drop in market values. This action has been followed by the stock exchanges throughout the country, and prices generally have remained well above the minimums formerly existing. This, it is pointed out, is sure proof of general business improvement, and what is considered more important at this time, of completely returned confidence on the part of the investing public.

Mountain States to Make Extensive Improvements.

The Mountain States Telephone & Telegraph Co. has commenced work on the complete overhauling of its telephone system in Dillon, Mont. It is estimated that several thousand dollars worth of improvements will be made and that the 40 men now employed on the work will be kept busy for at least four months.

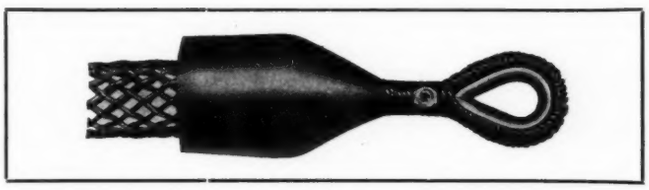
From Factory and Salesroom

Convention: Tri-State Independent Telephone Association, Memphis, Tenn., May 21, 22

Universal Construction Tools and Appliances.

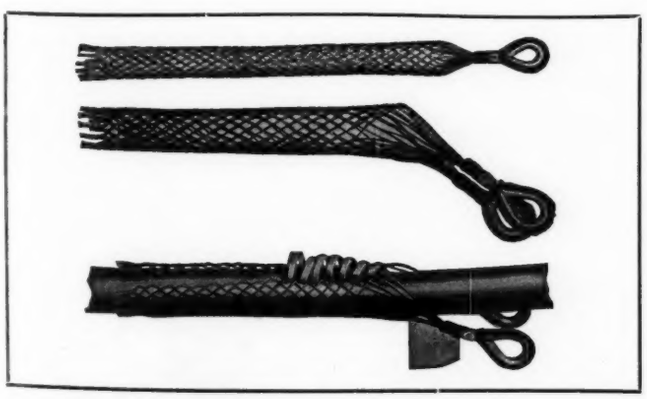
The Universal Cable Grip Co. of Syracuse, N. Y., has, for a number of years, been engaged in the manufacture of a popular line of specialty construction tools and appliances. It has been interesting to observe the development of this enterprise which, from a small beginning, has increased in size until it now occupies a splendid factory where its products are manufactured. Its products include Universal cable grips, the Universal Red-Top drive anchor, the Universal safety manhole guard and other Universal service specialties. Recognizing the fact that the success of any enterprise is determined by quality, satisfaction and service, the Universal company, it is maintained, has always endeavored to comply with these requirements.

Cable grips were the pioneer Universal specialties. Their popularity, the company states, is evidenced by the universal demand and usage, which not only includes many of the Independent telephone companies and the American Telephone & Telegraph Co. of the United States, but also some of the foreign telephone companies. The perfect



Collar Protector for Use with Single-Eye Cable Grip.

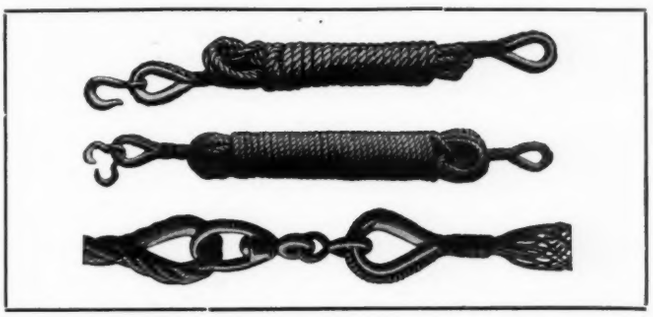
economy which the company claims is obtained by their use in handling cable without damage to the sheath, makes them very efficient for handling all types of aerial and underground cable. In operation, the cable grip takes hold of the cable at any point it may be placed. The gripping power in the fabric, due to the spring formation in the interlacing of the strand, offers an even pressure to all sides of the cable simultaneously, which is intensified when the strain is put on the pulling eye. In the application of the Universal cable grip, it is claimed, there is no



The Three Standard Types of Cable Grips.

strain great enough to damage the most perishable type of lead sheath paper covered cable.

Universal cable grips are standardized and made in three styles, as shown in the accompanying illustrations, with a range of sizes that will meet all ordinary requirements. The single-eye cable grips are used for attaching the pulling line to the end of a cable. The double-eye cable grips serve the purpose of pulling slack or of recovering old cable, while the double-eye split cable grips are especially adapted for shifting a working cable without cutting and without interrupting the service. A leather collar protector has been designed to be used with the Universal

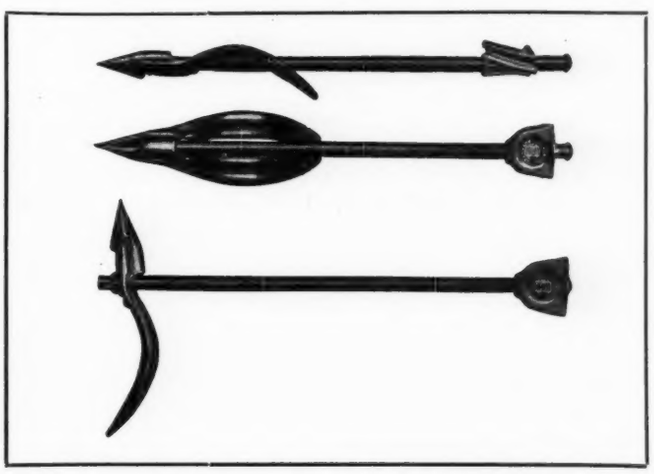


Open, Swivel and Sister Hooks for Cable Grips.

single-eye cable grip only. By the use of this collar, it is stated, the life of the single-eye grip can be greatly prolonged. Many conduits contain more or less sand and foreign matter, which tend to wear the cable grip, especially at a point near the neck. The leather overcomes this difficulty and, it is said, a considerable saving is effected by its use.

The practical engineering experience of the members of this firm, with some of the largest telephone companies in this country, has enabled them to originate their products along efficient and practical lines.

The Universal Red-Top drive anchor, shown in one of the illustrations, was evolved after many years of careful study. It represents a simplified form of anchor that is easily driven into the ground, opens automatically and becomes a permanent anchorage. To accomplish this purpose economically, the parts of the Red-Top anchor have been



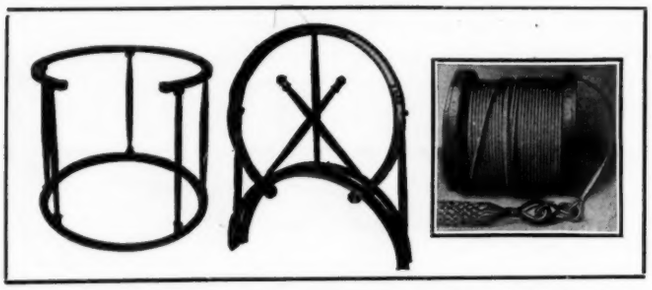
Universal Red-Top Anchor in Driving Position and Set.

reduced so that the completed anchor consists of but three fundamental pieces, as follows: The swivel Red-Top thimble; the perfect driving and guy rod, and the combination driving point and slug.

The swivel Red-Top thimble, which takes the place of the eye and thimble used with the ordinary type of guy

rod, forms a strong and serviceable swivel thimble, to which the guy strand is easily attached.

The Perfect driving and guy rod is made from a special high carbon steel which, it is said, prevents buckling of the rod under driving pressure. All threads, nuts, flattening and punching slots in the rod have been eliminated.



Manhole Guard—Pulling Line Equipped with Swivel Sister Hook.

A simple forged shoulder at the lower end engages the combination driving point and slug, while a plain upsetting at the upper end of the rod holds the Red-Top thimble in place.

The combination driving point and slug, made from 20-30 carbon open hearth steel, drop forged, offers the least resistance when in a driving position, but under a strain, automatically turns to a position at right angles to the rod, where it places its full area of resistance to the strain. The Red-Top feature of finishing the swivel thimble in a bright red enamel is intended to serve as a constant warning to traffic to avoid coming in contact with this danger point in all pole line construction.

The Universal safety manhole guards were especially designed to meet the requirements of a "safety first" appliance which will not only protect the public when a manhole is open on the street but will also safeguard the employe working below the street surface. These manhole guards are strong and rigid, being built to withstand rough usage. The guard is held open by a locking device and, it is contended, will remain so until unlocked. It can be folded flat, taking up a floor space 8 ins. by 38 ins., thus greatly facilitating transportation. Being built to a standard, both as to dimensions, quality and weight, the guards are consequently adapted for use on round or square openings of all dimensions. The upper part is finished in red so as to be easily seen by approaching persons.

Special fittings are now in the course of development for use with this guard. They consist of a locking device for securing the guard to an open manhole; a rubber dam or gasket which prevents water from running down a pavement and falling into an open manhole wetting an open splice; a waterproof top and side curtains enabling operations to be carried on regardless of weather conditions, and other features which, the company states, will be announced later.

Among the other Universal specialties are galvanized steel pulling lines, which are invaluable for underground conduit work and handling cables. Rope pulling lines equipped with swivel sister hooks are also furnished for many classes of plant work.

The Universal Cable Grip Co. will be pleased to send its literature to any interested company, upon request. The Universal calendar, which the company recently sent out, has provoked much interest and comment. The following piece of poetry was received from A. C. Almy, manager of the Delphos (Ohio) Home Telephone Co., acknowledging receipt of the calendar:

Received your nice "Calendar Universal."
Did you mail it out just to try us?
We're wise, cause we tended rehearsal,
Won't stand it a bit that you guy us.

Here in Ohio, April the first,
Began on fifth day of the week,
Proofreader kind o' gave you the worst
Of the deal; he sure was a "freak."

If we're wrong and you're right in the case,
Will you kindly elucidate,
Why in New York, the month we now face,
Started out four and twenty hours late?

In reply to Mr. Almy's letter, the Universal Cable Grip Co. sent the following apt response:

It may have been an error,
It may have been a fake,
But one thing is certain,
It kept out friends awake.

Do you know the Red-Top anchor,
The safety manhole guard,
The Universal cable grips,
Saving cable by the yard?

It is money in your pocket,
To buy of us you see,
For Universal products,
Are our specialty.

Don't hesitate to call us,
On things that may look funny.
We like to hear from all our friends,
And help them spend their money.

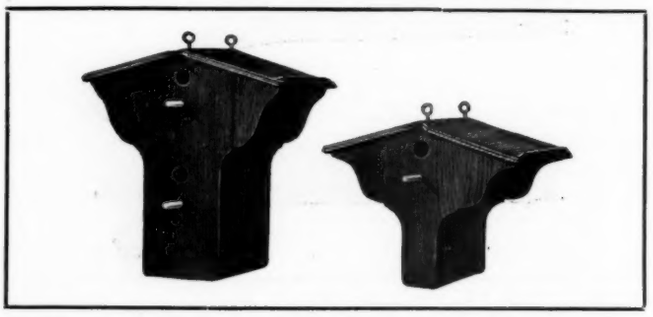
How about a Red-Top anchor
On the lines you wish to guy?
There's nothing like a trial
Before you have to buy.

Just send us a line or two;
A Red-Top will be shipped to you.

Converting Old Style Cabinets into Bird Houses.

The Garford Mfg. Co., of Elyria, Ohio, has made a departure along humanitarian lines, in the way of by-products. In line with the country-wide movement to save the birds, the company is making bird houses from the large stock of wooden telephone cabinets on hand, which have been replaced by modern steel cabinets and desk telephones, as far as common battery equipment is concerned. The idea came to a member of the company that instead of trying to build these old cabinets up with equipment and offering them to the trade at reduced prices, the company might join in the national "save the bird" movement and convert the old style cabinets into bird houses.

These bird houses are made in four types, apartment,

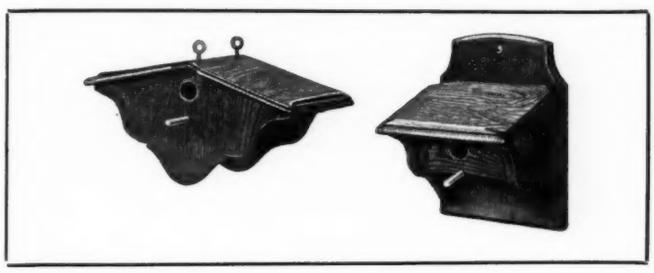


The Apartment and Swiss Chalet Types of Bird Houses.

Swiss chalet, bungalow and shanty type, as shown in the accompanying illustrations, and it is said the company is selling them at cost. The houses are arranged with openings for wrens, martins, blue birds, etc. In ordering, patrons are requested to name the type of bird expected to occupy the premises, so that the opening may be made to

suit the tenant. A perch is provided and also air holes under the eaves.

The first telephone man to see these bird houses, the company states, put in a request for inserts to be used when the bills are sent out, and he sent them to his sub-



Bungalow and Shanty Type Bird Houses.

scribers, with good results. The Garford company is prepared to furnish letter inserts to other telephone men who may desire to send them to their subscribers.

It may be a little late to put up bird houses and expect them to be occupied immediately, but, it is said by authorities on birds, it is a good idea to put them up about this time of the year so that they can become weathered and the birds may become accustomed to them.

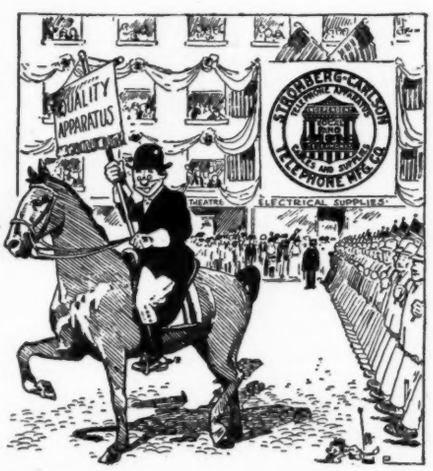
Jack Milburn Back on the Stromberg-Carlson Sales Force.

Jack Milburn will again represent the Stromberg-Carlson Telephone Mfg. Co., of Rochester, N. Y., in the state of Texas. Jack has been on the sick list for nearly two years but has now fully recovered his health, and is again on the firing line meeting the smiling faces of old customers.

Jack is an experienced and competent telephone man and the trade in the state of Texas will, undoubtedly, be pleased to see him back on the job. E. J. Dean, who traveled in Mr. Milburn's territory, has been assigned the state of Pennsylvania.

"Phoney Bill" Leads the Parade.

"Phoney Bill" says: "Quality apparatus always leads." The May blotter calendar of the Stromberg-Carlson Tele-



"Phoney Bill" Leads with "Quality Apparatus."

phone Mfg. Co., of Rochester, N. Y., shows "Phoney Bill" leading a parade and holding a "Quality Apparatus" banner high in the air. "Bill," as will be noticed in the accompanying reproduction from the blotter calendar, is "togged up" in a handsome riding habit and is mounted upon a spirited horse. In the distance is seen a building artistically decorated with flags and bunting, and in a conspicuous place just over an electrical supply store is seen the familiar Stromberg-Carlson trademark with the Independent shield in the center.

The dates 21 and 22 are marked as blue letter days in the May blotter calendar, these being the dates on which the convention of the Tri-State Independent Telephone Association is to be held at Memphis, Tenn. Decoration Day, May 30, is designated as a red letter day.

Record of Indian Motorcycle in Rural Trouble Work.

The adaptability of the motorcycle in furnishing rural telephone service is well illustrated in the use of an Indian motorcycle by the United Telephone Co., of Ellsworth, Kans., in repair work and trouble adjustment. The machine was bought from the Indian representative, Paul Warner, on August 15, 1914, and turned over to E. E. Wiliford, chief trouble shooter, to be used by him in his work, and to be paid for at the rate of five cents per mile. The record of his mileage is kept on surveyed charts in the company's office, instead of by the speedometer on the machine.

In the section covered by Mr. Wiliford there have been

E. E. Williford and His Motorcycle.

no roads, practically speaking, since December 15, but in the time that he has had the machine his record is as follows:

Month.	Miles Covered.	Expenses.
August	451	$ 4.20
September	791	7.85
October	1,039	13.75
November	1,070	13.10
December	321	5.70
January	43	.80
February	104	2.50
March	44	.40
Total	3,863	$48.30

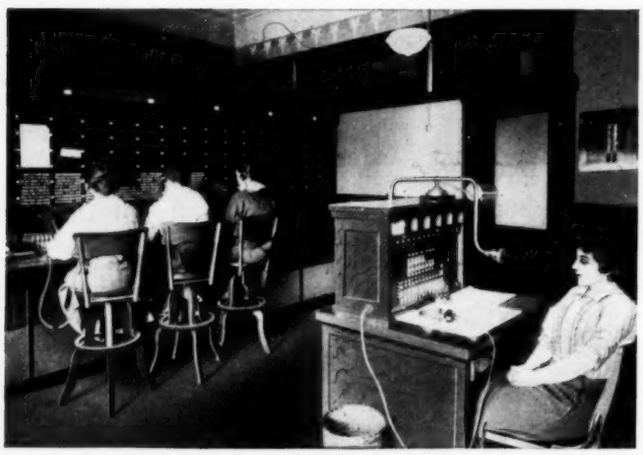
The average expense per mile for this period was $ .01245.

New Painesville, Ohio, Plant.

The Painesville Telephone Co., of Painesville, Ohio, installed a Kellogg instantaneous recall switchboard several months ago after some 20 years' experience with many makes of equipment. C. M. Grauel has been secretary and general manager of this company for the entire 20 years

of its existence. He was the first one to adopt the system of laying underground cable without using conduit. At present the company has nearly 50,000 feet of cable buried with a covering of tar paper and cement over it and has experienced very little trouble.

The company is giving its subscribers excellent telephone



Operating Room in the Painesville Exchange.

service, embodying features that have set a new record for traffic efficiency. The features include instantaneous recall, instantaneous answer, instantaneous disconnect, automatic ringing, and secret service.

The history of the organization is summed up briefly by Mr. Grauel as follows:

"Our company was organized in 1895 and began operation with 75 telephones in April, 1896. Have always had Bell competition. Our equipment has been from "push in the crank" to the last word in manual telephone apparatus, to which we have recently cut-over.

"We are well satisfied with our new equipment, which eliminates the basic trouble of manual switchboards; adds about 40 per cent. to the efficiency of our operators; gives the subscriber the best of service and did not cost any more than the average up-to-date common battery board.

"We have 1,400 telephones installed with 700 lines equipped. There are 350 telephones in the country working to the board common battery, some of our telephones being ten miles from town.

"You could not give us anything better because it is not yet made."

The officers of the Painesville Telephone Co. are as follows: F. A. Searl, president; Dr. D. J. Merriman, vice-president; W. R. Radcliffe, treasurer; and C. M. Grauel, secretary and general manager. The directors are Dr. C. F. House, P. K. Smith, and E. D. Keener.

Revised Price Sheets on Stromberg Construction Material.

Revised price sheets have been issued to the trade by the Stromberg-Carlson Telephone Mfg. Co., of Rochester, N. Y., for its bulletin No. 1003 on construction material and supplies.

The Stromberg-Carlson company states that of late it has been almost impossible to keep the trade posted on the prices of copper wire, due to the variable market conditions.

Any telephone company desirous of obtaining a copy of bulletin No. 1003, on construction material and supplies, can obtain one by dropping a line to that effect to the advertising department.

Telephone Conversation Admitted as Evidence.

Judge Long of the Springfield (Mass.) probate court has ruled that a telephone conversation between husband and wife, when there is a third party at one end of the line, is admissable as evidence. In the case of Alden vs. Alden one of the parties testified as to a telephone conversation held with the other party. Private conversations between husband and wife are ordinarily inadmissible as evidence in support proceedings, but the presence of a witness at one end of the line caused the justice to rule in the evidence.

L. S. Brach Supply Co. Moves to Larger Quarters.

The L. S. Brach Supply Co., of New York City, manufacturer of vacuum type lightning arresters, has moved its factory and main offices to larger quarters at 129 Sussex avenue, Newark, N. J. In its new quarters it has approximately 25,000 square feet of factory space and about an acre and a half of ground space devoted to the manufacture of the various products. Convenient shipping facilities and a building of a most modern type places the company in a position to produce goods under favorable conditions. The company's sales offices in New York and Chicago will still be maintained as heretofore.

Paragraphs.

American Telephone Fire Alarm Co., Chicago, has removed its offices from the Otis Building to the new Continental & Commercial National Bank Building, 208 S. La Salle St.

The M. W. Dunton Co., of Providence, R. I., has issued a four-page folder containing a description of, and a number of testimonials on, the Nokorode Solderkit.

A Patent Attorney Specialist.

Charles S. Wilson who has, for a number of years, specialized in the patent field, and who formerly was assistant examiner in the United States Patent Office, Washington, D. C., has established offices at 2054 Continental & Commercial National Bank Building, So. La Salle street, Chicago.

Charles S. Wilson.

Among some of Mr. Wilson's friends in the telephone field is the American Telephone Fire Alarm Co., of Chicago. Although a young man, only 37 years old, he has had an abundance of excellent training, his experience having embraced the canning, calculating, typewriter, weaving and gas engine industries. Mr. Wilson is a graduate of the University of Pennsylvania and the George Washington University of Law. He is a member of the Chicago Association of Commerce. Mr. Wilson will confine himself to soliciting of patents, copyrights, trade-marks, litigation and everything that pertains to patent cases.

Electrical Society Honors Inventor of Telephone.

The New York Electrical Society has given added recognition to the achievements of four leading figures in telephone history by electing to honorary membership Dr. Alexander Graham Bell, Thomas Augustus Watson, who was associated with Dr. Bell, and who with his own hands made the first telephone; John Joseph Carty, chief engineer of the American Telephone & Telegraph Co., and

Let us assist you to Finance your plant

No longer is it necessary for you to get a polite turndown for a loan from your banker. No longer will you need to experience difficulty in floating a bond issue. Neither will you have any trouble in financing your new construction.

The formation of the National Telephone Securities Co. is intended to give the Independent telephone companies assistance in preparing a bond issue; in locating a market for telephone bonds and assisting to obtain loans pending sale of bonds; to aid in financing new construction, so as to prevent reinvestment of earnings; to enable stock dividends to be paid rather than reinvestment of earnings in new construction and to invest the money of this company in bonds, thus making the earnings from INTEREST and DISCOUNT.

This will prove beneficial to both the small as well as the larger company. The success of this company depends upon the co-operation given it by Independent Companies. We have received numerous enthusiastic endorsements, many companies recognizing the value of the plan have immediately subscribed for stock. (Payable later.) We are now offering at par an unsold portion of $900,000 preferred stock which will be 5 per cent guaranteed cumulative profit sharing preferred stock. Par Value of stock $50. Send for subscription blanks and detailed information.

National Telephone Securities Co.

% H. H. Knipe

Olney Illinois

Dr. Michael Idvorskey Pupin, whose invention of the loading coil has contributed so much to the extension of long distance telephony.

New Exchange of Bell Company in Pittsburgh.

The new ten-story fireproof home of the Bell Telephone Co. of Pennsylvania in Pittsburgh, has just been completed. There is no wood in its makeup; even the doors and windows are metal, and all trimmed in steel. The building is located on Seventh avenue and covers 58 by 180 feet. Ground was broken for it April 1, 1914, and was scheduled to be finished on May 27, of this year. While that date is nearly a month distant the telephone company has already taken possession of the building and now occupies all but the first floor, which, while finished, will not be utilized until the extra work incident to moving time is gotten out of the way.

The new building is an addition to the old one adjoining it, which the company originally believed would be amply large. With the new building the floor area has been much more than doubled, but to make provision for additional floor space when needed the new building has been made strong enough to carry ten more stories.

Among the new features of the building are two fire towers, one inside on which fire balconies open and the outside fire tower, in the rear of the building. By these towers and fire balconies everyone in the building could leave it quickly and in perfect safety in case of fire. The cost of the new building is placed at $1,000,000.

Chicago Telephone Co. to Erect New Exchange Building.

The purchase by the Chicago Telephone Co. of four pieces of property on the south side of Washington street between Franklin and Market, aggregating 140 feet front for a total sum of $345,000, is for the purpose of providing a new main operating building in Chicago to take care of the apparatus for service in the northern portion of the business district, in place of the present quarters for the "Main," "Franklin," "Central," and "Randolph" exchanges.

The service in the southern portion of the business district, handled by the "Harrison" and "Wabash" exchanges, will shortly be entirely housed in the new building on Federal street near Harrison. "Wabash" has been in the new building for some time and "Harrison" will be moved there in the near future.

Whether it will be necessary to begin work this year will depend upon the conditions of the business. The approximate cost is to be $750,000.

Activities of the Ohio State Company.

The Ohio State Telephone Co., of Columbus, Ohio, has just completed the installation of automatic ringing, automatic disconnect, instantaneous recall and other time and labor saving devices in all of its exchanges.

The company is rushing pole setting and all the outside work for the two new exchanges which are expected to be in operation before this time next year. The largest of the exchanges will be the Madison, to be located at Lorain avenue and 65th street, which will cost about $300,000. The other exchange, to be known as the Lakewood, will cost $200,000.

Subscribers at Indianapolis Hear Sermon by Telephone.

General Manager E. L. Cline, and President William Fortune, of the Indianapolis Telephone Co., Indianapolis, Ind., recently conducted an experiment in the delivering of a sermon over the telephone. Manager Cline expressed the belief that the service would decline after the sixth party had been connected. President Fortune was connected as the seventeenth party and found the voice coming distinctly. The limit of the multiple was 19, but the operators became interested in using the lines of parties already connected for additional parties. The test started at 11 o'clock. At 11:15 Mr. Fortune had a connection as the twenty-fifth party, and at 11:40 he was connected as the sixty-third party and still heard the voice with great distinctness. The addition of other parties went on until it is estimated 200 persons were listeners on the line.

Citizens Company to Lay Conduit in Grand Rapids.

The Citizens' Telephone Co., of Grand Rapids, Mich., is planning to lay an underground conduit on Cherry street from Lafayette avenue to Union avenue, at an expense of about $14,000. The conduit will contain 450 pairs of wires running direct from the central station, thus giving accommodation for that number of additional telephones and relieving the south end substation so that that branch may increase its lines in other directions.

Subscribers Encouraged to Call Operator for Time of Day.

W. T. Laubach, manager of the Ohio State Telephone Co., at Akron, Ohio, has been much interested in the calls for "time please?" from his subscribers, having encouraged telephone users to call central when they wanted to set their clocks.

For several years the company has kept a record of the calls, says Mr. Laubach. During January of this year the calls reached their highest point, more than 7,800 persons calling for the time on the average daily. In 1912 the calls averaged about half that number.

Michigan State to Make Improvements at Saginaw.

The Michigan State Telephone Co. has decided to spend $70,000 in improving the Saginaw, Mich., plant, according to an announcement made by District Manager H. R. Mason of the company. The money will be used in enlarging the line and pole system, which will mean practically a complete rebuilding. More than half of the new telephone wire will be placed underground and about 500 miles of open wire will be replaced by telephone cable.

Operators Remain at Post While Fire Rages Below.

Sixty operators of the Ohio State Telephone Co., at Cleveland, Ohio, proved themselves plucky in remaining at the switchboards on the eighth floor of the Electric Building one night recently while a fire raged on the third floor. Smoke filtered to the room where the girls were working, but being assured by Miss Nellie Gibbons, the night chief operator, they continued at their work while the firemen battled the blaze.

Central Home Purchases Russellville, Ky., Plant.

The Central Home Telephone & Telegraph Co., with headquarters at Louisville, Ky., has purchased the property and holdings of the Russellville (Ky.) Home Telephone Co. at a foreclosure sale, resulting from default on bonds. The Central Home company will immediately make extensive improvements to the property. Between $10,000 and $15,000 will be spent in installing new cable and in making other improvements.

Grand Rapids & Indiana to Build Telephone Line.

The Grand Rapids & Indiana Railway Co. is building a telephone line for its own use between the cities of Grand Rapids, Mich., and Fort Wayne, Ind. It will be used for the company's business in place of the telegraph and eventually may be used for train dispatching.

New Rogers Park Exchange Opened.

The new Rogers Park exchange of the Chicago Telephone Co., located on Pratt Boulevard, between Clark street and Ashland avenue, Chicago, was recently cut into service. The first telephone exchange in Rogers Park, established 16 years ago, was a one-position switchboard and served 35 subscribers. Now nearly 5,000 telephones are connected with the new Rogers Park office.